ARMY, MARINE CORPS, NAVY, AIR FORCE

IADS

MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR AN INTEGRATED AIR DEFENSE SYSTEM

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MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES

FOREWORD

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PREFACE

1. Purpose

The purpose of this publication is to provide guidance for command, control, and communications-specific planning, coordination, and interoperability for an integrated air defense system (IADS). It facilitates decisions by highlighting link and communications architecture and interoperability capabilities to be considered by the joint force commander (JFC) and subordinate functional and Service component commanders when developing an IADS. The target audience is JFC/joint task force staff planners, component and functional commanders, and those unit commanders participating in and providing assets to a theater or specific area of operations. Additionally, it provides the warfighter and planner with a single-source reference for specific Service air defense capabilities and limitations.

2. Scope

This publication includes considerations for planning, coordination, integration, and employment of air defense systems for the JFC and those subordinate commanders participating in, and providing assets to theater operations. It provides the warfighter a single-source reference for specific Service air defense capabilities and limitations, and focuses on command, control, and communications architectures and interoperability issues to equip the warfighter with an understanding of each Service's systems.

3. Applicability

The procedures described in this publication apply to all elements of a joint force. This publication uses approved joint and Service doctrine and terminology as its foundation.

4. Implementation Plan

Army. Upon approval and authentication, this publication incorporates the procedures contained herein into the US Army Doctrine and Training Literature Program as directed by the Commander, US Army Training and Doctrine Command (TRADOC). Distribution is in accordance with applicable directives and the Initial Distribution Number (IDN) listed on the authentication page.

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b. This publication reflects current joint and Service doctrine, command and control organizations, facilities, personnel, responsibilities, and procedures. Changes in Service protocol, appropriately reflected in joint and Service publications, will likewise be incorporated in revisions to this document.

c. We encourage recommended changes for improving this publication. Key your comments to the specific page and paragraph and provide a rationale for each recommendation. Send comments and recommendations directly to—

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IADS
MULTI-SERVICE TACTICS, TECHNIQUES AND PROCEDURES FOR AN INTEGRATED AIR DEFENSE SYSTEM

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EXECUTIVE SUMMARY

IADS

Multi-Service Tactics, Techniques, and Procedures for an Integrated Air Defense System

An integrated air defense system (IADS) is not a formal system in itself but the aggregate of component air defense systems operating in a theater or specific area of operations. It is applicable to all levels of conflict in which a joint task force may be employed.

The purpose of this publication is to provide guidance for command, control, and communications-specific planning, coordination, and interoperability for an IADS. It facilitates decision making by highlighting link and communications architecture and interoperability capabilities that should be considered by the JFC and subordinate functional and Service component commanders responsible for developing an IADS plan. The target audience is component and functional commanders, joint force commander/joint task force staff planners, and those unit commanders participating in and providing assets to theater operations. Additionally, it provides the warfighter and planner with a single-source reference for specific Service air defense capabilities and limitations. Joint interface control cell support to the IADS is also addressed in this publication.

Chapter I provides a brief introduction and general IADS principles. Chapter II is the key portion of this publication; it addresses command and control (C2) relationships, communications architecture, and planning and execution of an IADS. Chapters III through VI provide an overview of Service-specific air defense C2, weapon systems capabilities/limitations, and planning and employment considerations. Appendix A provides considerations for an IADS in a multinational environment. Appendix B provides track ID/classification considerations, and Appendix C provides a notional outline of an air defense plan.

It is recommended that this publication be used in conjunction with FM 3 01.20/AFTTP(I) 3-2.30, *Multi-Service Tactics, Techniques, and Procedures for Joint Air Operations Center and Army Air and Missile Defense Command Coordination (JAOC/AAMDC),* and FM 3-52.2/MCRP 3-25F/NTTP 3-56.2/AFTTP(I) 3-2.17, *Multi-Service Tactics, Techniques, and Procedures for the Theater Air-Ground System (TAGS),* and FM 3-01.61/MCWP 3-25.11/NTTP 6-02.3/AFTTP(I) 3-2.39, *Multi-Service Tactics, Techniques, and Procedures for Mk XII IFF Mode 4 Security Issues in a Joint Integrated Air Defense System (IFF).*

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Chapter I
OVERVIEW

1. Background

a. An integrated air defense system (IADS) is comprised of sensors; weapons; command, control, communications, computers, and intelligence systems; and personnel. In combination, they provide defense against missiles and aircraft for an operational area. Integrating the Services' air defense systems enhances the employment of each Service's capabilities and enhances the level of defense provided to friendly forces.

b. A number of factors drive the requirement for a robust IADS capability. These include the proliferation of enemy missile systems with the capability to deliver weapons of mass destruction, which may create the necessity for US forces to operate and fight in more compressed battlespace with reduced warning and reaction time. In today's battlespace, the JFC must take full advantage of increasingly capable sensors, weapons, and C2 systems to counter enemy capabilities.

c. During recent joint operations the lack of connectivity; interoperable systems; and common tactics, techniques, and procedures (TTPs) forced the segregation of the battlespace into Service-specific, exclusive operational areas. As a result, individual Service air defense systems were sub-optimized and the IADS could not function to its full capability.

2. Threat

a. The threat is comprised of two elements: aircraft (manned and unmanned) and theater missiles (TMs), including theater ballistic missiles (TBMs), intercontinental ballistic missiles (ICBMs), cruise missiles (CMs), and air-to-surface missiles (ASMs). All air and missile threats must be neutralized or destroyed as far away as practical from friendly forces.

b. Theater air and missile threats vary by region and in technological sophistication. Technology transfers and weapons proliferation complicate our ability to assess all potential threats with certainty. The number of countries with TM capability is likely to increase. Improved technology and increases in the number of enemy deployed TM systems pose increased risks to United States (US) forces. Many countries also possess and continually upgrade modern combat aircraft. The proliferation of CMs, TBMs, ASMs, and unmanned aerial vehicles (UAVs) complicates the tasks of providing force protection and attaining air superiority. Plans should anticipate the effects of electronic warfare, combat losses, and communications degradation on system operations.

3. Principles of an Integrated Air Defense System

a. Centralized Planning and Direction. Centralized planning and direction is essential for controlling and coordinating the efforts of the forces. It maintains unity of effort and optimizes the contributions of all forces.

b. Decentralized Execution. Decentralized execution permits timely, decisive action by tactical commanders without compromising the ability of operational-level commanders to control operations. Decentralized execution is essential because no one commander can control the detailed actions of a large number of units or individuals.

c. Planned Responses. Planned responses support prompt, decisive tactical action by exploiting prior testing and development of optimal net setup, Service doctrines, force operations, and courses of action.

d. Effective and Efficient Communications. Efficient communications support timely data and information exchange, and optimize net effectiveness, and maintains operational tempo by avoiding unnecessary communications.

e. Layered Defense. Layered defenses provide multiple opportunities to engage attacking aircraft and missiles, ideally at the maximum range from friendly forces.

f. 360-Degree Coverage. 360-degree coverage guards against unpredictable targets, pop-up targets, and multi-threat/multi-axis attacks.

g. Early Detection, Discrimination, Classification, and Identification. Early detection, discrimination, classification, and identification support prompt warning of attacks and timely cueing; they also enable prompt, informed decision support for engaging time-sensitive targets.

4. Conclusion

Competing demands for air and missile defense resources require detailed planning so that every air defense asset is employed to the full extent of its capability. Developing an IADS enables a more effective and efficient use of those resources.

Chapter II
IADS INTEGRATION

1. Command Relationships

a. Combatant Commands. The Unified Command Plan establishes combatant commands. Initial IADS planning should begin during the peacetime deliberate planning process at the combatant command. Baseline IADS plans must include component systems, manning, and training requirements. The combatant commander may assign responsibility for IADS command, control, communications, computers, and intelligence (C4I) systems planning requirements to subordinate JFCs.

b. Joint Force Commander.

(1) Primary responsibilities of the JFC as they apply to counterair include the following:

(a) Develop and maintain a system to unify the employment of subordinate forces in carrying out assigned counterair missions.

(b) Develop and produce joint operation plans for counterair and airspace control or delegate authority to subordinate commanders.

(c) Establish appropriate command relationships for the component commanders.

(d) Define and assign areas of operation (AOs) for land and naval force commanders.

(e) Establish plans, policies, programs, priorities, and overall requirements for intelligence activities.

(f) Assign tasks, functions, and responsibilities to, and direct coordination among, the subordinate commands to ensure unity of effort in accomplishing joint counterair missions.

(g) Establish, coordinate, and disseminate rules of engagement (ROE) to all subordinate commanders.

(2) JFC Staff. The JFC's staff assists the JFC in the decision-making and execution process.

c. Joint Force Air Component Commander (JFACC). The JFACC is given the authority necessary to accomplish the missions and tasks assigned by the JFC. The JFACC typically exercises tactical control (TACON) over air capabilities/forces made available for tasking. The JFC may also establish supporting and supported relationships between the JFACC and other components to facilitate operations. The JFACC conducts joint air operations in accordance with the JFC's intent and concept of the operation. When the JFC designates a JFACC, the JFACC normally assumes the area air defense commander (AADC) and airspace control authority (ACA) responsibilities, since air defense and airspace control are an integral part of joint air operations. As the designated commander for joint air operations, the responsibility for planning, coordinating, and developing airspace control procedures and operating an airspace control system also rests with the JFACC. When the situation dictates, the JFC may designate a separate AADC and/or ACA. In those joint operations where separate commanders are required and designated, close coordination is essential for unity of effort, prevention of fratricide, and deconfliction of joint air operations (JP 3-30).

d. Area Air Defense Commander (AADC). The JFC normally designates an AADC with the authority to plan, coordinate, and integrate overall joint force defensive counterair (DCA) operations. The JFC will also define the support relationship between the AADC and supporting commanders. With the support of Service or functional component commanders, the AADC develops, integrates, and distributes a JFC-approved joint area air defense plan. Components will provide representatives, as appropriate, to the AADC's headquarters to provide specific weapon systems expertise as well as broader mission expertise. With the support of Service or functional component commanders, the

AADC develops, integrates, and distributes a JFC-approved joint air defense plan. A critical feature of a joint, integrated plan is a reliable, consistent, and common operational picture (i.e., a fused and correlated air, ground, and maritime picture) available in all supporting C2 facilities. This plan should include IO strategies for counterair. The plan should also contain detailed weapons control and engagement procedures that are integral to all joint counterair operations. The plan should be closely integrated with the airspace control plan (ACP), and the AADC establishes weapons control procedures and measures for all DCA weapon systems and forces. However, this does not restrict commanders' authority to use all necessary means and take all appropriate actions to protect their forces from a hostile act or demonstrated hostile intent. Primary responsibilities of the AADC include the following:

(1) Develop, integrate, and distribute a JFC approved joint area air defense plan.

(2) Develop and execute a detailed plan to disseminate timely air and missile warning and cueing information to components, forces, allies, coalition partners, and civil authorities, as appropriate.

(3) Develop and implement identification and engagement procedures that are appropriate to the air and missile threats.

(4) Ensure timely and accurate track reporting among participating units to provide a consistent common operational picture.

e. Regional Air Defense Commander (RADC)/Sector Air Defense Commander (SADC). The AADC may elect to divide the JOA into regions and/or sectors, depending on the size of the area, the magnitude of the operation, and the complexity of the force's command and control structure. If the JOA is divided into regions/sectors, the JFC will designate commanders for these areas.

f. Airspace Control Authority (ACA). The JFC normally designates an ACA who has overall responsibility for establishing and operating the airspace control system. The ACA also develops policies and procedures for airspace control that are incorporated into an ACP and promulgated throughout the theater. A key responsibility of the ACA is to provide the flexibility needed within the airspace control system to meet contingency situations that necessitate rapid employment of forces. The ACA coordinates through the ACP the use of airspace, including integration with the host nation and deconfliction of user requirements. The ACP is implemented through the airspace control order (ACO). All forces affecting joint air operations are subject to the ACO.

g. Component Commanders. The term component commander may refer to Service, functional, or subordinate commanders. Component commanders will advise the JFC on the employment of forces and the direction and control of those forces. Each component commander plans and executes a portion of the total air effort, interacts with the other components and as directed by the JFC, conducts active defense in accordance with weapon control procedures and measures established by the AADC. Subject to the authority of the JFC, each component commander within a joint force—

(1) Coordinates and prioritizes their operations and needs with the JFC and other component commanders.

(2) Employs air defense weapon systems in accordance with the rules of engagement (ROE) and the area air defense plan (AADP).

(3) Coordinates and deconflicts the employment of assigned and attached forces with other subordinate commands. Coordination for combat airspace control may be facilitated by through collocating key airspace control facilities, air defense, and fire support coordination agencies.

(4) Provides airspace control in designated areas in accordance with the ACP. Is prepared to assume airspace control in other areas when combat or other factors degrade the ACS.

(5) Forwards requests for airspace control measures (ACMs) in accordance with the ACP.

(6) Develops detailed airspace control instructions, plans, and procedures in accordance with ACP guidance. Keep these detailed instructions, plans, and procedures consistent with JFC-approved airspace control guidance in the ACP.

(7) Provides necessary facilities and personnel for airspace control functions in assigned areas and identifies these facilities and personnel for inclusion in the ACP.

h. C4I Manager. The JTF C4I manager is responsible to plan, oversee, and maintain the C4I infrastructure to support operations. This is both a peacetime and contingency requirement and must account for force flow. Close coordination with other combatant command C4I managers is essential to ensure continuity of communications and information sharing as forces flow between theaters. The C4I manager provides the critical voice and data connectivity necessary to support IADS operations.

i. Joint Data Network (JDN) Operations Officer. The JTF JDN operations officer is responsible for all JDN operations, including the intelligence network, ground network, multi-tactical data link (TDL) network (MTN) and, when applicable, the sensor network. The JDN operations officer ensures interoperability and integrates joint forces information systems that provides the JDN input to the common operational picture. Close coordination with the JTF C4I manager is essential to integrate and support warfighters across component boundaries. For more information, see CJCSM 3115.01, *Joint Data Network (JDN) Operations.*

j. Joint Interface Control Officer (JICO). The challenge of managing the joint force TDL networks led to the development of the JICO. With regard to the IADS, the JICO cell is responsible for planning, establishing, and maintaining the MTN and provides a common tactical picture input to the JDN for integration into the common operational picture. CJCSM 6120.01C, *Joint Multi-Tactical Data Link Operating Procedures (JMTOP)*, provides necessary guidance for planning and executing the MTN. Commanders may establish regional/sector interface control officer (RICO/SICO) for each RADC/SADC. The RICO/SICO will report to the RADC/SADC to develop and maintain their portion of the common tactical picture (CTP). RICOs and SICOs will coordinate with and answer to the JICO for planning and execution functions that cross regional boundaries or impact the theater-wide JDN. The JICO may recommend resolution of architectural and data coordination issues between RICO/SICO cells. For more detailed information on JICO responsibilities, see CJCSM 6120.01C.

k. Other Network Managers Supporting the IADS. Network managers also exist for intelligence networks, ground networks, and composite track networks and are subordinate to the JDN operations officer. The JDN operations officer will coordinate systems and information exchange requirements for all network managers.

l. Liaison Officers (LNOs) and Augmentees.

(1) LNOs. Effective liaison between forces is essential for coordinated IADS operations and is a key factor in the success of joint operations. LNOs serve as their parent commanders' eyes and ears as well as their representative on matters of Service capabilities and limitations. LNOs need to have clearly defined parameters to take action and make decisions on operational matters. Functional component commanders, who may also be Service component commanders, will use parent Service liaison elements. Additional information for LNOs is available in FM 5-01.12/MCRP 5-1B/ NTTP 5 02/AFTTP(I) 3-2.21, *Multi-Service Tactics, Techniques, and Procedures for Joint Task Force Liaison Officer Integration (JTF-LNO).*

(2) Augmentees. Staffs may determine a need for augmentation to fulfill the requirements for additional planning and mission execution. When requesting augmentees, the staffs must specify exact qualifications and experience levels of personnel desired. Augmentees are integral parts of the staffs to which they are assigned.

(3) Air Defense Artillery Fire Control Officer (ADAFCO). The ADAFCO is a special LNO and acts as a single Army point of contact between land-based air and missile defense (AMD) fire direction centers and the controlling authority, e.g. tactical air operations center (TAOC) or control and reporting center (CRC). The ADAFCO coordinates and monitors the information exchange between the controlling authority and the information coordination center. The ADAFCO understands and can explain Army weapons capabilities and employment parameters to the controlling authority. The ADAFCO executes engagement operations, battle management, and "friendly protect" functions for ground based air defense forces.

2. IADS Planning and Execution

a. General. Basic planning for an IADS is derived from JFC objectives, guidance, and intent. The sophistication of the threat, the scope of defended assets, the volume of airspace in which air superiority is required, and location of IADS assets determine specific design requirement for forces. Planning requires representatives from the various component commanders' planning staffs to provide expertise on component assets and capabilities. IADS information and systems exchange requirements are included in the AADP. Planning the IADS begins with mission analysis, including critical areas such as ROE, threat, friendly theater air and missile defense resources, and the JFC's critical asset list (CAL). Further considerations that are vital to the success of an IADS are aircraft employment, C2 integration, tanker support, airborne C2 warfare/ISR availability, chain of command, air tasking order (ATO) production cycle, and civil air traffic flow. Based on the outcome of mission analysis, position air and missile defense assets to maximize the detection, tracking, identification, decision (battle management), and engagement of hostile aircraft and missiles.

b. Command and Control. The integration of air and missile defense systems presents a challenge for the AADC and IADS planners. For example, some Army air defense artillery (ADA) units will defend assets on the defended asset list (DAL), while others support land component maneuver forces. For units tasked against the DAL, the chain of command proceeds from the AADC. However, the chain of command for ADA units in support of maneuver forces stems from the maneuver force commander. The Army Air and Missile Defense Command (AAMDC) commands and employs the echelons above corps (EAC) ADA brigades in support of the AADC and coordinates the integration of corps ADA brigades that support the land component maneuver forces. One way of facilitating unity of effort for land based missile defense systems is through the ADAFCO (located at TAOC or CRC) for Army ADA, and through the Marine Liaison Officer (MARLO), normally located at the JAOC, for the Marine Corps air defense units. Coordination between components is critical and must be clearly articulated in the AADP (to include engagement priorities and communications channels). Mobile IADS units must receive timely updates to the ATO, ACO, and special instructions (SPINS) in addition to dynamic updates to avoid fratricide.

c. The RADC/SADC (when the JOA is divided into regions and/or sectors) needs awareness of the location and movement of all the mobile IADS assets to avoid fratricide and to promote effective airspace control. The ADAFCO must know locations and scheme of maneuver for ADA units in order to ensure effective employment of missile defense systems by the RADC/SADC. Navy air defense units (ADU) may be capable of providing DAL coverage while simultaneously providing fleet defense. If ADUs are dual tasked, any changes in their ability to meet the DAL tasking should be identified to the Naval and Amphibious Liaison Element (NALE) through the RADC/SADC.

d. Area Air Defense Plan (AADP). The JFC establishes objectives and guidance for employment in the theater operations plan (OPLAN) or concept of operations (CONOPS). The OPLAN or CONOPS serves as a framework for planning. The AADP is based on the JFC's operational concept and allocation decisions and establishes air and missile identification (ID) procedures. The AADP is developed to effectively integrate the capabilities of all Services. See Appendix C for an example of an AADP. In preparing the AADP, the AADC will consider the entire range of enemy air threats, likely courses of

action, and the capabilities and limitations of friendly air defense systems. The AADC normally develops additional products during the planning process. These include inputs into operational tasking data links (OPTASKLINK), which is the guidance for establishing the link architecture, and inputs into the tactical operational data (TACOPDAT), which is used to establish air defense and antiair warfare responsibilities in a tactical area. Other products requiring coordination are the ATO, SPINS and ACO.

e. Intelligence. Intelligence includes, at a minimum, the enemy order of battle (EOB), the friendly order of battle (FOB), and intelligence preparation of the battlespace (IPB). IPB is a continuing process employed to reduce uncertainties concerning the enemy, environment, and terrain. The primary intelligence organization providing support to the joint force is the supported combatant command's Joint Intelligence Center (JIC). The JIC integrates the intelligence support capabilities of all services and combat units within a central activity. AADC intelligence planners will use the Global Command and Control System (GCCS), resident intelligence support systems, and other systems to perform IPB in support of AMD planning. These systems will host, maintain, and provide a gateway to various intelligence-related databases (e.g., the EOB). During IPB, the database is analyzed in detail to determine the impact of the enemy, environment, and terrain on operations. In conjunction with the component commanders, the operations directorate of a joint staff (J-3) shall compile and distribute the FOB.

f. Critical Asset List/Defended Asset List. The CAL is a prioritized list of critical assets, identified by phase of the operation. It is developed by the J-5 with component input, coordinated through the J-3, and approved by the JFC or the combatant commander. The CAL is the critical component in the AADC's positioning of active air defense forces. The AADC uses the CAL, EOB, and IPB in planning the arrangement of forces; surveillance and ADWs; and in establishing weapons control status (WCS), aircraft, and missile ID procedures. The DAL is a prioritized list of those assets from the CAL, which available resources will defend. It is included in the OPLAN and AADP. The DAL is subject to change as operations progress.

g. Theater ROE Considerations. ROE is a critical part of the IADS planning and employment process. Planners should continuously evaluate the impact of ROE on accomplishing the IADS mission and ensure that the AADP is consistent with current theater ROE. All forces supporting the air defense mission must comply with current ROE. Supplemental ROE is normally requested in order to support the IADS mission. Clearly delineate self defense criteria in the AADP and SPINS, down to the specific platform (e.g., Patriot) to ensure all friendly forces have a thorough understanding of self defense ROE. Flight profiles and routes (e.g. minimum risk routes, low level transit routes, and standard army flight routes) are intricately linked to self defense criteria; properly annotate them in the ACP and ACO to minimize potential for fratricide.

h. Surveillance Planning/Execution Considerations.

(1) Detection. The types of sensors and their placement determine the detection capability of the IADS. The threat, threat axis, terrain, weather, time-distance analysis, defended assets, desired engagement zone, and surveillance requirements will affect sensor placement. Various predictive sensor coverage planning tools exist (e.g., Improved-Many-On-Many (IMOM), Joint Defensive Planner (JDP), Falcon View, etc.) to assist planners. Sensor plans must also consider a number of other factors such as accessibility, connectivity, force protection, mutual interference, and host nation support.

(2) Tracking. The surveillance plan will directly contribute to the ability of the IADS to consistently and efficiently track airborne objects. The three most commonly accepted plans include mutual support (preferred method), track/report by exception, and track production areas (or a combination). Each has advantages depending on the mix of platforms and their degree of interoperability. Regardless of the surveillance plan adopted, surveillance and data link planners must consider the following factors to minimize the effects of gaps in interoperability:

(a) Track Deconfliction. The assumption that all C2 participants will always see the same tracks, with the same identity, and in the same place is not valid and leads to misunderstanding and mistakes. Robust voice communication among C2 agencies is critical to resolving track discrepancies. Platform sensor differences aggravate preexisting problems of miscorrelation and dual tracking. This can cause the following:

- C2 surveillance tracks not updating/tracking aircraft.
- C2 surveillance tracks that appear to be tracking aircraft but are not.
- C2 surveillance tracks that "swap" or "jump" from one aircraft to another.
- Identification, friend or foe (IFF) modes and codes swapped among tracks.
- Dual Tracks. Dualing is the occurrence of multiple tracks on one target. It results in an air picture with more tracks than actual aircraft. This occurs frequently within the IADS. Failure of some surveillance systems to correlate contacts with Precise Participant Location Identifier (PPLI) tracks can also cause dual tracking.

(b) Correlation Problems. Correlation problems include varying size of correlation windows, auto correlation system differences, or lack thereof, radar-measured altitude differences between systems, IFF conflicts by systems, sensor registration/gridlock problems, and lack of familiarization of other Service system capabilities and operations. Track correlation problems can create ID conflicts, which are dangerous and can result in loss of situational awareness. All combat systems introduce a certain amount of ambiguity into the "Link" and though TDL message standards are common to all services, the implementation of those standards is inconsistent and selective. Combat system software baselines and ID doctrine can also introduce uncertainty into shared data. It is incumbent on the combat system and TDL operator to ensure tracks are correctly identified. Every opportunity within tactical timelines should be taken to resolve all track and ID ambiguities prior to engagement by the firing unit. Details of tracking shortfalls are contained in Joint Combat Identification Evaluation Team (JCIET) evaluation reports (see the JCIET website at https://jciet.eglin.af.mil).

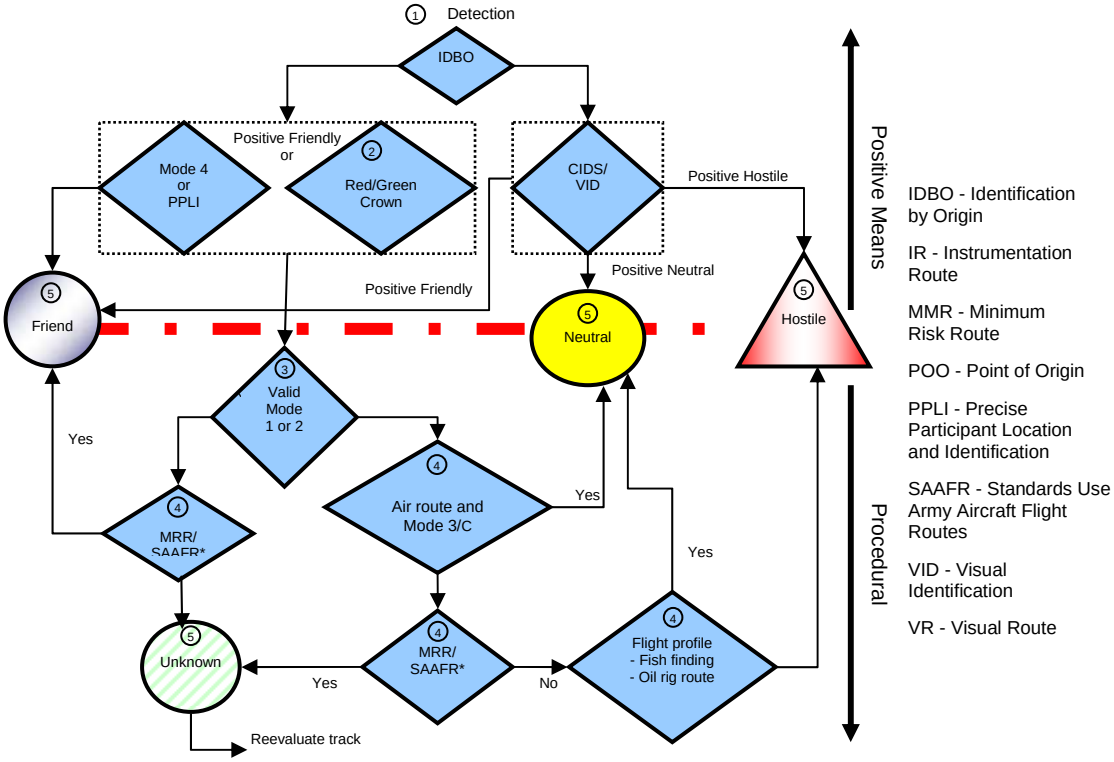
i. Combat Identification (CID). CID is the process of attaining an accurate characterization of detected objects in the battlespace to the extent that high confidence, timely application of tactical military options and weapons resources can occur. Depending on the situation and the operational decisions that must be made, this characterization may be limited to, "friend," "enemy," or "neutral". Other situations may require other characterizations, including, but not limited to, class (TBM, CM and UAV), type, nationality, and mission configuration. CID characterizations, when applied with the combatant commander's ROE, enable engagement decisions and the subsequent use, or prohibition of use, of lethal and non-lethal weaponry to accomplish military objectives. CID is used for force posturing, command and control, situation awareness, and shoot/no-shoot employment decisions (see the CID Capstone Requirements Document). The use of positive ID measures (visual observation and/or electronic ID systems) is the preferred method of operation. In the absence of positive ID, procedural ID (which employs previously established and promulgated airspace control measures) is used. Generally, some combination of positive and procedural ID will be used. However, the risk of fratricide may make the positive ID of hostile a requirement for meeting the defined CID threshold for "attaining an accurate characterization" in theater ROE. Technological challenges also make this currently the biggest limiting factor in the kill chain. Within tactical timelines, all attempts to acquire positive CID should be exhausted before engaging suspected targets.

(1) CID Matrix Development Versus TDL Track ID/Classification Implementation. Track ID/classification shared over a TDL may not support the CID process. Planners must consider participating force TDL system implementation of track ID/classification in deciding how to portray a particular track in C2 systems. The JICO cell planners will provide a list of TDL-supported track ID/classification to the AADC in support of developing the CID plan.

(a) The CID matrix must take into consideration the limitations inherent in the employed systems that will implement the CID procedures. Once the track symbology set is determined, the use of voice prowords for these symbols must be aligned. Pay particular attention to the "BANDIT" codeword versus the system's HOSTILE track symbol. See Appendix B for more information.

(b) Build the CID matrix to the lowest common denominator, i.e. what everyone can classify/transmit/receive/forward, in order to support the shooter, **or the risk of fratricide exists**.

(c) Figure II-1 provides a notional CID matrix for tracks.



1. Update IDs at any level in the ID matrix; IDBO or POO considerations
2. ID Friend by voice/data link verification
3. In accordance with daily ATO/SPINS
4. RTF/MRR and civilian air routes listed in ACOs and Annex F (Airspace) and does not include military VR and IR training routes
5. In accordance with track classification guide.

Figure II-1. Sample Combat Identification Matrix

(2) ID Criteria. ID criteria are used to support current ROE as well as standing rules of engagement (SROE) in light of weapon systems capabilities. The AADC is responsible for developing IADS ID criteria and submitting the same for JFC approval. ID criteria will be published in the AADP with specific instructions in the ATO and/or SPINS.

(3) ID Considerations. The AADC may use the following considerations when developing ID criteria consistent with and in support of SROE and current ROE:

(a) IFF Modes (I-IV per the ATO).

(b) PPLI.

(c) Procedural measures (for example, minimum risk routes).

(d) A radar contact correlated with a voice (position) report from an air or ground control agency.

(e) Off-board/on-board combat identification systems.

(f) Visual ID.

(g) Formation Assessment (FA) ("guilt by association"). FA is a procedural ID that can be used to identify all members in a group of targets. This group ID is based on the ID (IAW the ID criteria) of at least one member of the group. Factors such as similarity to known threat tactical formations and relative spatial relationships (distance, speed, and altitude) must contribute to the FA ID of these groups. Once the group has been identified, if the group is observed to split, all contacts in each of the resulting groups maintain the ID. This ID methodology requires that one or more radar systems (e.g. fighter or C2) continuously monitor the group or groups during the split. The group is considered "continuously tracked" if not lost/faded for more than one sweep/cycle.

Note: Army AD radars do not use group IDs and procedurally each track is manually evaluated using current ID criteria.

(h) Point of origin.

(i) Track maneuvers (e.g., noncompliance with airspace control measures).

(j) Validate kinetics versus threat.

(4) Positive ID considerations.

(a) Positive ID is a high-confidence ID derived from visual observation and/or electronic ID systems. When available, positive ID is used because it provides the most rapid, reliable, and transferable means of identification. Most enemy positive hostile IDs are derived from technology-based ID systems that exploit the physical or electronic characteristics of a target (e.g., noncooperative target recognition (NCTR), signals intelligence, and electronic support measures). During planning and execution phases for air defense, all participants must consider the capabilities and limitations of available platforms such as the RC-135 Rivet Joint, E-3 Airborne Warning and Control System (AWACS), EC-130 Senior Scout, E- 2 Hawkeye, EP-3 Aries II, Patriot, and Aegis (depending on ship configuration). For example, all are voice product net capable and all have TDL capability. IADS planners should ensure that integrated broadcast service (IBS-I) producers are included in the forces (or requested).

(b) Not all participants may see the same ID-related information. This is dependent primarily on system implementation, J-series vs. M-series message standards, and operator display capabilities. Because of the different implementation of TDL messages, planners should consider limiting the number of track classification symbols to reduce confusion and the potential for fratricide. Positive ID (either on-board or off-board) or visual ID will always be part of the ID process.

Note: Due to the recent NSA decertification of the Mark XII Mode 4 system [DIRNSA message 081811Z Oct 03] ID planners should refer to FM 3 01.61/MCWP 3-25.11/NTTP 6-02.4/AFTTP(I) 3-2.39, *Multi-Service Tactics, Techniques, and Procedures for Mk XII IFF Mode 4 Security Issues in a Joint Integrated Air Defense System.*

(5) Procedural ID. Procedural ID is another identification method that relies on airspace control measures promulgated through the ACP, ACO, and SPINS. Procedural ID separates airspace users by geography, altitude, and time. Normally, a combination of positive and procedural ID is used to identify friendly and hostile tracks.

(6) Auto-ID Systems. Many systems, including aircraft carrier Auto ID, Aegis, and Patriot, have the capability to execute an auto-ID function. Planners and operators must ensure that the level of use of auto-ID is consistent with theater CID policies and procedures. Properly implemented, auto-ID can reduce the workload of operators and improve the timeliness of the ID process; improperly implemented, it can result in mistaken-IDs and increase the potential for fratricide. Auto-ID should be explicitly expressed in the ROE. Automation does not replace the judgment of operators in a tactical situation. Details of ID considerations are contained in JCIET evaluation reports (see the JCIET website at https://jciet.eglin.af.mil).

j. Decide (Battle Management). The AADC has certain systems and authorities to control the battle. These include air defense warning conditions, weapons control status, ID authority, commit authority, and engagement authority. The JFC may divide the operational area into air defense regions and air defense sectors, as appropriate. Each region and sector will have respective RADCs and SADCs. For example, the SADC may be subordinate to a RADC who in turn is subordinate to the AADC. The AADC may decentralize the battle by delegating some or all AADC authorities to the RADC/SADCs. The following are two tools used in air defense battle management, which are issued concurrently:

(1) Air Defense Warning Condition (ADWC). The ADWC is a degree of air raid probability based on the threat assessment. The AADC establishes the baseline ADW for the joint force, which may be different for an air breathing threat and a missile threat. Subordinate air defense commanders may issue higher, but not lower ADW for their region or sector. ADWs are disseminated though C2 channels to all air and missile defense elements and fire units.

(a) ADWC White: an attack by hostile aircraft or missile is improbable.

(b) ADWC Yellow: an attack by hostile aircraft or missile is probable.

(c) ADWC Red: an attack by hostile aircraft or missile is imminent or in progress.

(2) Weapons Control Status. WCS includes free, tight, hold/safe. They describe the relative degree of control of air defense fires. The AADC establishes the WCS for the joint force, which may be different for an air breathing threat and a missile threat. This authority originates with the AADC and can be delegated to any subordinate commander. Different weapons control statuses may be applied simultaneously to different weapons systems, and/or volumes of airspace.

(a) Weapons Hold/Safe: fire only in self defense or in response to a formal order.

(b) Weapons Tight: fire only on targets positively identified as hostile in accordance with current ROE.

(c) Weapons Free: fire at targets not identified as friendly in accordance with current ROE.

(3) ID Authority. The AADC will establish the ID policy and will promulgate it via the SPINS and/or an OPTASKLINK supplement. Execution of the ID policy is normally delegated to the tactical level; however, take care that the tactical commander is capable of performing the ID function in real time. Units can reliably share three IDs across the IADS: friend, hostile, and unknown. Units can also share neutral ID; however, there are inconsistencies in how “neutral” is interpreted and displayed by some systems (see Appendix B). Proper and consistent execution of the ID policy is extremely important in order to minimize fratricide. Note that the TDL hostile ID and symbol does not necessarily constitute authority to engage. Therefore, as previously stated, potential TDL ambiguities should be resolved within tactical timelines before allowing weapons employment to avoid fratricide. Proper application of ROE in effect must be taken in conjunction with ID and WCS (free, tight, or hold/safe) to constitute authority to engage.

(4) Commit Authority. Commit authority describes the air defense control echelon that may dedicate an asset to prepare to engage an entity (e.g., position a DCA fighter to intercept or direct an ADA unit to track and target). Commit authority does not imply engagement authority. Further permission is

required to engage an entity that has been committed upon unless the unit committing the resource also holds engagement authority. Commit and engagement authorities are typically split during the transition phase of a major campaign or during containment and show of force operations in order to avoid accidental escalation of conflict.

(5) Engagement Authority. The JFC is vested with authority to prosecute engagements within the theater/JOA consistent with ROE currently in effect. For air defense engagements within the IADS, the authority is normally delegated to the AADC who may further delegate the engagement authority to tactical levels. Keep the degree of delegation consistent with the ROE, the DAL, and the inherent right of self-defense.

k. Engagement. Early warning of hostile air and missile threats is vital for layered defense. Air defense assets are layered to provide point and area defense. Although defensive operations are reactive in nature, conduct them as far from the friendly forces or operational area as feasible. To counter enemy air and missile threats, the engagement process must continue throughout the approach to, entry into, and departure from the friendly operational area. Weapons system placement is closely tied to the DAL. A combination of fighter engagement zones (FEZ), missile engagement zones (MEZ), and joint engagement zone (JEZ) will be established to maximize engagement efficiency among all air defense platforms. Integrated operations in a JEZ require robust and reliable communications. See JP 3-52, *Doctrine for Joint Airspace Control in the Combat Zone* and FM 3-52.2/MCRP 3 25F/NTTP 3-56.2/AFTTP(I) 3-2.17, *Multi-Service Tactics, Techniques, and Procedures for the Theater Air-Ground System (TAGS)* for more information on engagement zones. Figure II-2 shows a graphical representation of engagement zones.

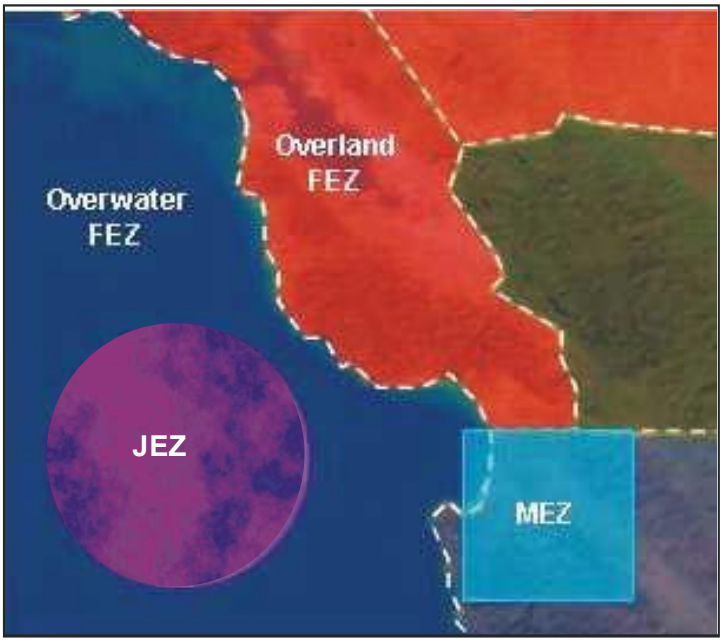


Figure II-2. Engagement Zones

l. Tactical Warning. Tactical warning is the act of disseminating warning information of a threatening or hostile act to personnel within the area of risk. Base this warning on an evaluation of information from all available sources. Though the AADC has overall responsibility for providing

tactical warning, the responsibility for providing warning to assigned forces lies with all commanders. All personnel must respond to tactical warning information IAW their assigned responsibilities.

m. Planning Applications. Air defense planning tools include Joint Defensive Planner (JDP), Command, Control, Battle Management, and Communications System (C2BMC), Theater Battle Management Core System (TBMCS), Area Air Defense Command System (AADCS), Air and Missile Defense Workstation System (AMDWS), GCCS, and the Patriot Tactical Planner.

3. Communications Architecture

Effective employment of the IADS relies on effective voice, network, and data communications. IADS communications requirements are a subset of the overall JTF communications requirements and will compete with other mission areas for limited bandwidth and frequency allocations. Use simplicity and redundancy to ensure the capacity for dynamic bandwidth management and graceful degradation. Due to differing communications equipment, media capability, and cryptographic capabilities at the units that constitute the IADS, there are significant challenges to interoperability and integration. Follow-on forces flowing into theater must understand the existing JTF communications architecture to ensure they bring the correct capabilities to integrate into the numerous IADS voice and data nets. Normally, the JFC operational order (OPORD) Annex K and the AADP Annex K lay the foundation for communications architecture.

4. Conclusion

An IADS is not a formal system in itself, but the sum of component air defense systems. For each of these systems to operate within an integrated whole, it is imperative that everyone working within the system understand the various components' capabilities, limitations, and how to best utilize them within the IADS. Coordinated planning between the AADC and component commanders' planning staffs is required. While planning is important for establishing an efficient defense architecture, it is critical that all weapons system operators be thoroughly familiar with aircraft and missile flight profiles and characteristics and on-going friendly air operations (through the ATO, ACO and SPINS) to develop the situational awareness that will avoid fratricide. Chapters III-VI provide an overview of each Service's air defense systems, capabilities, and limitations. Each Service chapter provides detailed information on mission, organization, command and control, weapon systems, planning, and operations.

Chapter III
ARMY AIR DEFENSE

1. Introduction

Synchronizing and integrating Army capabilities in air and missile defense operations is a complex process. It involves coordinating C2 organizations and capabilities with specific data links, communications and intelligence capabilities, weapon systems capabilities, and data architecture. For the joint planner, understanding the planning considerations in support of the IADS is very important.

2. Mission

a. The air defense artillery (ADA) mission is: Army air and missile defense (AMD) forces with other elements of the joint, interagency, and multinational (JIM) team at strategic, operational, and tactical levels;, will provide AMD and contribute to situational awareness/understanding;, airspace management; , and operational force protection to deter or defeat enemy air and missile threats, protect the force and high value assets, enable freedom of maneuver. This mission is normally executed within a combined theater and requires integration and close coordination of Army AMD with other joint forces. Mission sets for AMD forces are:

(1) Provide air and missile defense.

(2) Contribute to situational awareness/understanding.

(3) Contribute to airspace management.

(4) Contribute to operational force protection.

b. Integration of the air and missile defense mission into the IADS is accomplished by the Army's ADA units.

3. Organization and Function

Within a theater or AO, all elements of the Army air defense structure are not required to be in place in order for Army elements to interface in a joint operation. When in place, Army air defense forces are organized as follows:

a. AAMDC.

(1) AAMDC Role.

The AAMDC is normally under the OPCON of the ARFOR commander or joint forces land component commander (JFLCC). When directed by the JFC, AAMDC assets may be placed in direct support of the JFACC / AADC as appropriate. The roles of the commanding general of the AAMDC are Senior Army ADA commander, theater Army air and missile defense coordinator (TAAMDCOORD), and DAADC. Coordination and liaison functions between all three are essential to effective air and missile defense operations within a given theater. The AAMDC and JAOC intelligence personnel build a collaborative TAMD IPB, which serves as the basis for JTAMD strategies and plans. The AAMDC (attack operations section in coordination with the intelligence section) submits TM target nominations directly to the JAOC for inclusion as JFACC nominated targets. The AAMDC also sends a robust LNO team (active defense, intelligence, and attack operations personnel) to support the JFACC, AADC, and DAADC requirements and may deploy the AAMDC TOC (Main) to the JFACC, AADC location. As the senior Army air defense element at the AADC's location, the AAMDC LNO team serves as the primary interface at the JAOC for all land-based active air defense (see Table III-1).

(2) AAMDC Functions.

(a) Deputy Area Air Defense Commander (DAADC). The JFC and AADC will determine whether a DAADC should be designated. Normally, the commander of the AAMDC assumes the role of the DAADC to serve as an advocate for land-based air and missile defense and because the AAMDC possesses the C2 assets to perform DAADC responsibilities. This designation formalizes the relationship between the land-based air and missile defense assets dedicated to theater level missions and the AADC, and helps to ensure fully integrated and synchronized air and missile defense operations.

- Integrate land-based AMD into theater DCA operations.
- Advise the AADC regarding rules of engagement (ROE) [weapon control status, weapon control procedures, states of readiness/emission, fire control orders (FCOs), etc.], airspace control measures (ACMs), weapon control measures, and air defense warning (ADWs).
- Assist the AADC with air defense plan development.
- Advise the AADC on matters regarding land-based air and missile defense operations and capabilities.

(b) Senior Army ADA Commander. The senior Army ADA commander is the Army proponent for the air and missile defense combat functions and has the responsibility for active air and missile defense planning within the Army forces. When assigned for the entire land force, the senior Army ADA commander provides the following functions:

- Single POC for Army AMD in theater.
- Conducts AMD operational-level planning.
- Conducts defense design/ operational-level planning.
- Recommends DAL.
- Commands all EAC Patriot units.
- Plans for recovery and reconstitution.

(c) TAAMDCOORD. The TAAMDCOORD is an integral member of the ARFOR or JFLCC's staff planning team and provides the following:

- Develops and maintains TAMD IPB/situation template.
- Provides LNOs to higher and JTAMD C2 nodes and accepts LNOs from lower elements and components.
- Synchronizes missile defense operations.
- Develops AMD Annex for ARFOR/JFLCC.
- Provides vulnerability analysis/NBC reporting.
- Disseminates early warning.
- POC for operational protection (OP).
- Plans and synchronizes all OP tasks.
- Input to target nomination process.
- Assists in target definition.
- ISR recommendations.

Table III-1. Roles/Tasks of the AAMDC Commander			
TAMD	***Senior ADA Commander***	***Theater Army Air and Missile Defense Coordinator (TAAMDCOORD)***	***Deputy Area Air Defense Commander (DAADC***
C4I	Single POC for Army AMD in theater	Synchronizes missile defense operations Develops and maintains TAMD/situation template Provides LNOs to higher and JTAMD C2 nodes and accepts LNOs from lower elements and components	Integrates Army AMD in theater Integrates two levels of modernized force Provides LNOs (ADAFCO) to CRC/TAOC/Aegis Integrates AMD communications (data/voice)
Active Defense	Conducts AMD operational-level planning Conducts defense design/ operational-level planning Recommends DAL Commands all EAC Patriot units	Develops AMD Annex for ARFOR/JFLCC	Chairs coordination (reprioritization) board Recommends CAL/DAL with CVT methodology Assists with AADP development Issues SAM Tactical Order (STO) Advises on coalition AMD integration
Passive Defense	Plans for recovery and reconstitution	POC for operational protection (OP) Plans and synchronizes all OP tasks Disseminates early warning Provides vulnerability analysis/NBC reporting	Assists in theater early warning
AO		Assists in target definition ISR recommendations Input to target nomination process	Assists in target definition ISR recommendations Input to target nomination process

b. The Army ADA brigade and divisional ADA battalions accomplish the majority of tactical air and missile defense missions. The corps ADA brigades and the divisional ADA battalions, respectively, are the corps and division commanders' primary air and missile defense resources. The corps commander's requirement to provide air and missile defense resources to forces is no different from the requirement to provide maneuver and fire support resources. The corps commander must ensure that forces at all levels have air defense protection and must reinforce those defenses when necessary. Of particular importance is the corps commander's requirement to provide high–to–medium altitude air defense (HIMAD) protection to divisions, with specific emphasis on giving support to offensive operations. The division commanders require corps support for HIMAD air defense and any additional SHORAD weapons needed for mission accomplishment.

(1) The ADA brigade mission is to protect forces and selected geopolitical assets from air and missile attacks and surveillance. This mission may require the brigade to deploy within or to a theater of operations with tactical lift assets or strategic lift assets. Elements of the brigade may deploy early to protect a lodgment or early entry operations. The brigade may operate initially under the OPCON of the JFLCC or in direct support of the JFACC as forces flow into theater. During all phases of the operation,

the brigade must be integrated into the theater air defense system and provide early warning of and defend against theater missiles (TMs), manned, and unmanned aircraft. ADA brigade missions range from TM defense of corps or JFC activities or assets to reinforcing coverage of a divisional tactical maneuver ADA brigade.

(a) EAC ADA Brigade.

- The EAC ADA brigade force protection missions include the protection of theater level sustaining bases, military or political headquarters, or ports of debarkation against air and missile attack. The EAC ADA commander is responsible for the planning and execution of ADA plans and missions at the tactical level and ensures that the brigade is integrated and synchronized with adjacent, higher and lower ADA operations. The EAC ADA brigade commander may also function as the AMDCOORD.

- EAC brigades may deploy early into the theater to protect Aerial Ports of Debarkation (APODs), Sea Ports of Debarkation (SPODs), early arriving forces, and critical supplies. As entry forces move into tactical assembly areas (TAA) for expansion operations, ADA forces maneuver and reposition to force protection. As the lodgment is expanded, ADA conduct operations to defend designated critical assets such as C2 nodes, locations of political importance and military forces.

- Units conducting active defense at theater level normally consist of one or more EAC ADA brigades that provides command and control over assigned forces. The brigade commander task organizes active defense forces to protect designated assets identified on the DAL.

(b) Corps ADA Brigade.

The corps ADA brigade commander is the corps air defense officer and serves as the corps commander's air and missile defense coordinator (AMDCOORD). Air and missile defense responsibilities include the following:

- Ensuring corps air and missile defense requirements are integrated into theater air and missile defense plans.

- Coordinating the overall AMD planning with the corps higher headquarters (ARFOR), adjacent corps, subordinate elements within the corps and with EAC brigades and the AAMDC as appropriate.

- Developing and recommending to the corps commander air and missile defense priorities in conjunction with the G3 plans and other corps staff elements.

- Preparing the air defense estimate and annex for corps plans and orders.

- Advising the corps commander on overall AMD integration, synchronization, and employment to include monitoring organic and attached unit status and locations down to battery level, and divisional, regimental, separate ADA brigade status down to battery level. This also includes nominating appropriate targets for attack operations as part of the TMD fight.

- Informing the corps commander of the AMD rules of engagement and procedures applicable to AMD assets operating within the corps sector.

- Assessing the air and missile threat, in concert with the corps G2, and assisting the G2 in preparation of the integrated IPB.

- Making recommendation to the corps commander on reconstitution or reorganization of AMD assets within the corps.

(2) The ADA battalion is the basic operational ADA unit.

(a) Patriot battalions have five firing batteries and are assigned to EAC and corps Brigades to defend against aircraft and lower-tier missile threats.

(b) Maneuver air defense units have four firing batteries per battalion. The division maneuver air defense battalions have Avenger and Linebacker air defense systems supported by the forward area air defense (FAAD) C4I system using the Sentinel Radar.

4. Command and Control

a. Command and Control. The AAMDC normally commands all ADA forces defending echelon above corps units/assets (EAC AD units). These ADA forces are normally organized into brigades. The AAMDC may also have other forces assigned or attached under its command. ADA units defending Corps and divisional units/assets remain under the command of those commanders vice the AAMDC. The AAMDC does not directly execute air defense engagement operations; this function is the responsibility of the engagement authority (EA). The AADC is the engagement authority and normally will not delegate EA for air threats below the SADC, RADC, or CRC level.

(1) All components of the joint force share the AOR and/or JOA airspace for offensive and defensive operations. Airspace control is very complex; close coordination between components is critical and must be clearly articulated in the AADP (to include engagement priorities and communications channels). ADA brigades assign an ADAFCO to the SADC to act as a single point of contact for Army AD units to coordinate and resolve airspace control, ID, battle management, and friendly protect issues. The ADAFCO/MARLO works with the AADC/SADC to deconflict the airspace and execute AD engagement operations. The ADAFCO advises the AADC/SADC on ground-based air defense capabilities and limitations. Airspace control should maximize the effectiveness of combat operations without adding undue restrictions and with minimal adverse impact on the capabilities of any Service or functional component.

(2) Army air defense C2 encompasses multiple echelons in the planning and operations of Army air and missile defense systems. C2 is enabled through the use of a tactical operations center (TOC). TOCs exist in some form at every command level: AAMDC, EAC, and corps ADA brigade level—TOC; battalion level—tactical command system (TCS); and battery level—battery command post (BCP). TOCs provide a common, integrated, and digitized C4I capability that automates and integrates the performance of engagement operations (EO) and force operations (FO) functions for air and missile defense (battery through AAMDC) as well as joint force elements. Contained within the TOC is an integrated system of hardware and software known as the air and missile defense planning and control system (AMDPCS). The AMDPCS contains the computers, communications, and ancillary equipment required to plan and execute air and missile defense operations. Table III-2 summarizes the systems and functions of AMDPCS TOC equipment interface. The AMDPCS that constitutes the AAMDC TOC is shown in Figure III-1. The AMDPCS is tailored to each echelon and can perform the following functions:

(a) Monitor the execution of operations.

(b) Synchronize combat activities to sustain tempo and adjust the plan to the situation.

(c) Maintain situational awareness.

(d) Sustain the tempo of operations by ensuring a continuity of combat consumables.

(e) Provide a focal point for the receipt and development of intelligence.

(f) Plan future operations.

(g) Monitor combat operations of supported, adjacent, and higher echelon organizations.

(h) Provide situational information to higher headquarters.

(i) Conduct air defense engagement operations.

Table III-2. Army Tactical Operations Center Equipment

Systems	Functions
Air Defense Systems Integrator (ADSI)	EO and FO functions at brigade level and above.
Air and Missile Defense Workstation (AMDWS)	Provides near real-time air picture as a planning tool for radar coverage and system firing fans.
All Source Analysis System (ASAS)	Displays EOB; assists in analysis; and receives, prints, and plots intelligence reports and imagery.
AN/ARC-187/210 UHF Radio	Receives UHF TDL-A data.
Advanced Field Artillery Tactical Data System (AFATDS)	Assists in fire support management, passes launch points, and accesses friendly artillery database.
Automated Deep Operations Coordination System (ADOCS)	Displays units and airspace control means; used to plan deep targets through the corps' Deep Operations Coordination Cell (DOCC); provides situational awareness to targeting officer.
Commanders Tactical Terminal (CTT-3, CTT-HR) and Joint Tactical Terminal (JTT)	Receives UHF for IBSI/IBSS.
Generic Area Limitation Environment (GALE)	Terrain analysis using resident database; can do location suitability modeling for threat systems.
Global Command and Control System (GCCS)	Multi-Service C4I data.
Harris RF-350 HF Transceiver	Receives HF TDL-A data.
Interim Pager Alert Warning System (IPAWS)	Provides missile warning/force warning through pagers.
Joint Deployable Intelligence Support System (JDISS)	Provides automated/connectivity to facilitate collection and coordination of intelligence information.
Joint Services Work Station (JSWS)	Provides moving target indicator (MTI)/synthetic aperture radar (SAR) data, and initiates remote sensor relay (RSR).
JSTARS Common Ground Workstation (CGWS)	Provides MTI/SAR data and initiates RSR.
Joint Tactical Information Distribution System (JTIDS) and Multi-Functional Information Distribution System (MIDS LVT-2)	Receive and transmits TDL-J data.
Joint Warning (JWARN)	Receives, displays, and transmits nuclear, biological, and chemical (NBC) messages.
LST-5/PST-5 SATCOM Radio	Receives LOS UHF secure data and voice communications.
Maneuver Control System (MCS)	Provides comprehensive friendly force info and inbound missile warning.
Patriot Task Force Planner (PTFP)	Provides real time air picture as a planning tool for Patriot radar coverage, defense design, and system firing fans.
Worldwide Origin and Threat System (WOTS)	Receives and correlates JTAGS, ALERT, and TACDR reports and alerts.
Forward Area Air Defense EO	Provides automated EO functions in support of the FAAD TOC.

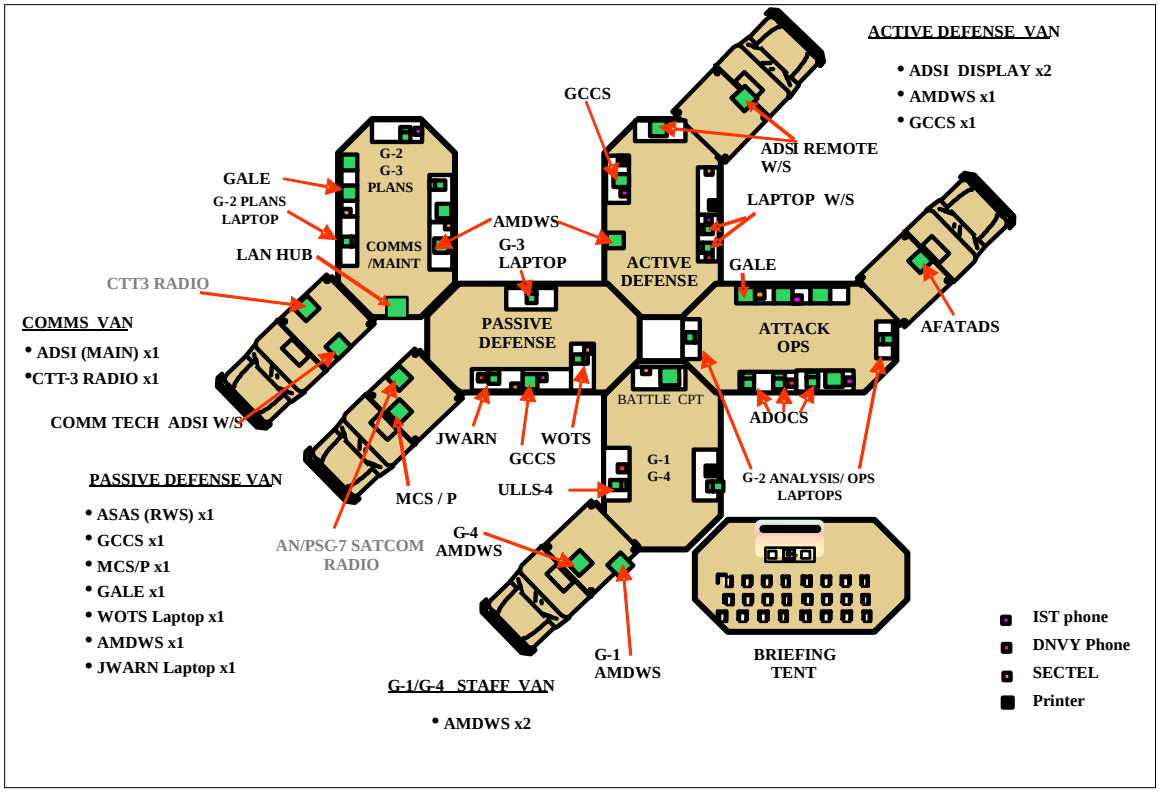


Figure III-1. AMDPCS Configuration for AAMDC

(3) Air Defense Airspace Management (ADAM). The ADAM cell deploys with the Stryker Brigade Combat Team (SBCT) or with other divisional units that do not possess an organic air defense battalion. It conducts continuous air and missile defense planning and coordination, monitors aerial situational awareness within the SBCT/assigned unit's AO, and performs Army airspace command and control (A2C2) with Army aviation assets. The ADAM cell has only A2C2 capabilities and possesses no organic air defense weapon systems. Other air defense assets are task-organized based on the SBCT or divisional unit's mission and potential threat. The ADAM cell integrates and provides data connectivity with IADS and establishes initial operational capability. (See Table III-3 and Table III-4.)

b. FAAD C4I provides maneuver air defense weapons and C2 centers with digital automated target information from Sentinel and joint sensors with battle command information. Along with the AMDWS, it provides automated EO and FO capabilities in maneuver air defense battalions. FAAD EO capabilities include near real-time early warning and cueing information for maneuver air defense weapon systems, friendly aircraft identification, and air battle management. AMDWS FO capabilities include automated mission and staff planning for interoperability with other Army battlefield control system components. The C2 data architecture of Army air and missile defense units is implemented as shown in Figure III-2.

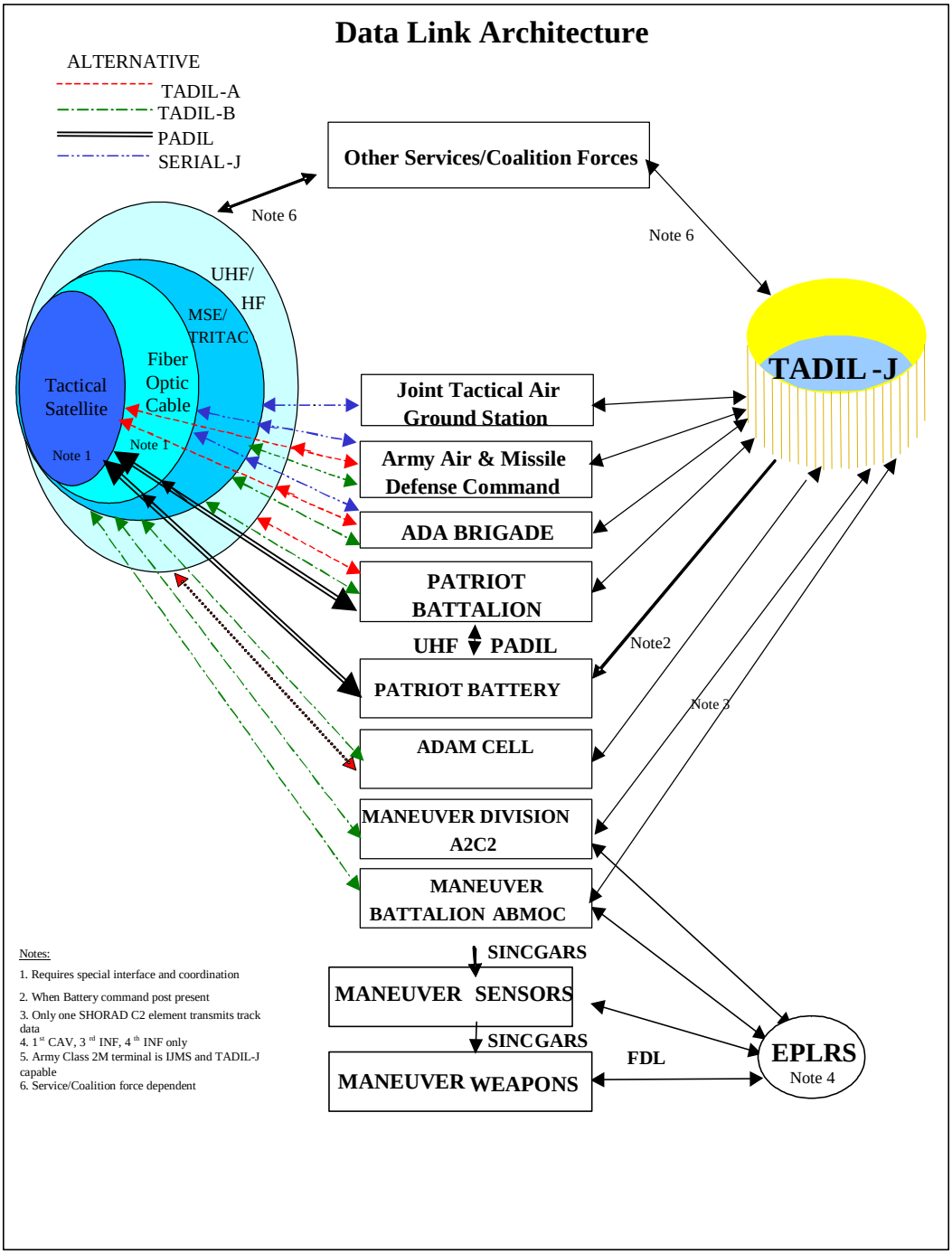


Figure III-2. Army Air and Missile Defense Data Architecture

c. The Joint Tactical Air Ground Station (JTAGS) is a national level information processing system that receives and processes in-theater, direct down-linked data from Defense Support Program (DSP) satellites. JTAGS disseminates warning, alerting, and cueing information on TBMs and other tactical events of interest throughout the theater using existing communications networks. Its in-theater

location provides the earliest warning, and units can tailor it for and link it to theater-unique terrestrial C4I systems.

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Table III-3. Key Army Interfaces and Their Characteristics

Interface Characteristics	AAMDC and ADA Brigades	Army Patriot Information Coordination Center (ICC)	Army Patriot Battery Command Post (BCP)	Air Defense Air Space Management (ADAM) Cell	ARMY Maneuver Air Defense With FAAD C4I (Sentinel Radar)
1. Missions	Threat Detection and Warning SAM Control Air Defense Management Tracking Identification	Threat Detection Tracking Identification SAM Control Air Defense Management	Situational Awareness	Threat Detection and Warning Tracking Identification Air Defense Management	Threat Detection Tracking Dissemination Warning Cueing Air Battle Management
2. Technical Functions (Includes Mission Categories for Weapons Coordination and Management and Control)	PPLI Air Surveillance Weapons Coordination and Management Information Management Mission Management Point Surveillance	PPLI Air Surveillance Weapons Coordination and Management Information Management Point Surveillance	PPLI	PPLI Air Surveillance Weapons Coordination and Management Information Management Point Surveillance	PPLI Air Surveillance Weapons Coordination and Management Information Management Mission Management Point Surveillance
3. Types of Tracks Maintained and reported to interface	Air EW Points	Air EW Points		Air EW Points	Air
4. Interface data link capability/limitations	TDL B TDL J SERIAL J TDL A Army tactical data link 1 (ATDL1) FDL IJMS	TDL A TDL B TDL J ATDL1 PADIL IJMS	TDL J	TDL A TDL B TDL J FDL IJMS	TDL-J FDL TDL- B IJMS
5. Track position data base limits	Within 1024 data miles of the system coordinate center (SCC)	For unit locations: +/- 1,023.5 data miles from own SCC. The other track positional data +/- 511.75 data miles from own SCC.		Within 1,024 data miles of the SCC	410 KM
6. Maximum display area	1024 Data Miles	1,024 KM x 768 KM		1,024 Data Miles	400 KM x 400 KM
7. Data registration	Done automatically with respect to the DLRP.	Done automatically with respect to the DLRP.		Done automatically with respect to the DLRP.	Manual input to coordinate converting parameters.
8. Track number	OPTASKLINK	OPTASKLINK	OPTASKLINK	OPTASKLINK	OPTASKLINK

Table III-3. Key Army Interfaces and Their Characteristics (Continued)					
9. Track Identification		Automatic (passive/active) Manually (passive/active)			Automatic with manual override adjustable parameters
10. Voice Communications requirements/capabilities	Air Defense Command and Control Net (ADCCN)/DCN/ track supervision network (TSN) SC TACSAT/UHF/HF	ADCCN/DCN/ TSN UHF**	ADCCN/DCN/ TSN	ADCCN/DCN/ TSN SC TACSAT/UHF	ADCCN/DCN/ TSN HF
11. Correlation	Automatic if within 5 data miles when in Auto Track Mode. No correlation done over joint interface.	Automatic (correlation block size is variable as a function of aircraft position).		Automatic if within 5 data miles when in Auto Track Mode. No correlation done over joint interface.	Automatic correlation from Sentinel Radar feed at Sensor C2 Node.

Table III-4. Army Unit Communications Capability Matrix								
User→	**AAMDC**	**BDE TOC**	**BDE/FDC/ ADAFCO**	**BN TOC**	**BN ICC**	**BTRY**	**ADAM CELL**	**FAAD**
↓COMMS								
LINK 11 HF	X	X	X				X	
LINK 11 UHF	X	X	X		X (2)		X	
LINK 11B	X	X	X		X		X	X
LINK 16	X	X	X		X	X w/BPC	X	X
IBS-I	X	X	X		X		X	
IBS-S	X	X	X				X	
SCTACSAT	X	X	X	X	X (1)	X (1)	X	X (1)
NIPR	X	X	X	X			X	X
SIPR	X	X	X	X			X	X
CHAT	X	X	X	X			X	X
PADIL					X	X		
UHF VOICE	X	X	X	X	X	X	X	X (1)
SECURE VTC	X	X						
DSN	X	X	X	X	X	X		
TAC PHONE	X	X	X	X	X	X	X	
AMDWS	X	X	X	X		X	X	X
TAC PLANNER				X		X		
ADSI	X	X	X				X	
GALE	X							
GCCS	X							
WOTS	X							
PAWS	X							
JSWS	X							
ASAS LITE	X		X				X	
CSPC	X	X						

5. Weapon Systems

Table III-5 describes the following weapon systems characteristics:

a. Avenger. The Avenger weapon system is a lightweight, day and night, limited adverse weather fire unit. The fire unit consists of two turret-mounted Stinger/MANPADS missile pods, a .50-caliber machine gun, a forward-looking infrared (FLIR) system, a laser rangefinder, and an IFF system. The FAAD C4I provides targeting information to assist in target acquisition. The fully rotating turret is mounted on a high mobility multipurpose wheeled vehicle (HMMWV). The sensor components and armament system are gyro-stabilized for shoot-on-the-move capability and can slew-to-cue in response to early warning (EW) information. The gunner operates the system from inside the turret or from a remote control unit (RCU) away from the HMMWV when static. On-board communications equipment provides for radio and intercom operations.

b. Linebacker. The Bradley Linebacker is mounted on an M6 Bradley vehicle and has a crew of four personnel with an integrated, externally mounted Stinger/ Man-Portable Air Defense System (MANPADS) launcher, which is mounted in place of the tube-launched, optically tracked, wire-guided (TOW) missiles. The Bradley Linebacker can fire while moving, maintaining pace with the armored forces. The crew remains under armor protection during engagements and missile reloading. An integrated position, navigation, and north-seeker capability allows for on-the-move cueing. The FAAD C4I provides targeting information to assist in target acquisition.

c. Patriot is a mobile, medium-to-high altitude air and missile defense system that protects critical assets and maneuver forces from TBMs and air-breathing threats (ABTs), and CMs. Patriot is the centerpiece of the Army's TAMD force. The Patriot system currently has four fielded missile versions: Patriot Advanced Capability-3 (PAC-3), Patriot Advanced Capability-2 (PAC-2), the Guidance Enhanced Missile (GEM), and the GEM+. The PAC-3 missiles are kinetic hit-to-kill, whereas the PAC-2, GEM, and GEM+ missiles are proximity fuse burst kill. Contact the TRADOC Systems Manager Lower Tier Office, Ft. Bliss, Texas, telephone DSN: 978-7410/2241 or commercial (915) 568-7410/2241 for more information on Army weapons systems.

Table III-5. Weapon Systems Characteristics

Weapon Characteristics	Patriot	Maneuver Air Defense Avenger/Linebacker
Targets	TBM CM TASM	Airplanes Helicopters CM UAV
Sensor range/ planning range	Classified	Sentinel Radar 40 km (Dependent on location of radar). On-board detection is visual or FLIR/ISU
ID capability	IFF/SIF Weighted system	IFF Visual
Number of fire units per battalion	5	Heavy Division: 36(Avenger) 24(Linebacker) ACR
Number of missiles loaded per launcher and platform	4 GEM/GEM+/PAC-2 or 16 PAC-3	Avenger (8) Linebacker (4) with 6 on-board reloads
Coverage angle of supporting radar	Track and search sectors are classified	360 degrees up to 30,000 feet
Engagement range (planning)	69 KM	4 KM

6. Planning

The AAMDC Commander and other representatives in the Service component headquarters are responsible for active air and missile defense planning. The AAMDC assists in integrating air defense and TAMD priorities into the force's defended asset prioritization process. Active, passive, and other combined arms air defense measures are included in the air defense estimate. The AAMDC also ensures coordination between higher and lower air defense echelons, as well as at adjacent units for vertical and horizontal integration of air defense coverage throughout the battlefield. In force-projection operations, this will include integration with joint or multinational counterair and TBMD participants. If the AAMDC commander is the senior air defense commander in theater, then the AAMDC commander is designated as the TAAMDCOORD, which may expand the scope and role as a theater coordinator.

a. Operational Planning.

(1) The focus of air and missile defense planning at the operational level is on protection of forces and assets IAW the commander's intent. The AAMDC allocates ADA units to EAC and corps ADA brigades based upon the CAL and the concept of operations for land operations. While planning for air and missile defense of the ARFOR AO, the ARFOR also considers the contributions of the other components to protect the force from air and missile attack.

(2) In the air and missile defense plan, the JFC may task the AAMDC and the EAC ADA brigades to protect theater assets such as airbases, logistics facilities, seaports, and geopolitical assets, as well as maneuver forces in assembly areas. In addition to corps asset defense, the JFC may also task commanders to protect theater assets within their AO to provide economy of force.

b. Operational Planning Process.

(1) Air defense planning at the operational level is an iterative process. Once the AADC develops the air defense concept for the theater, the ARFOR, through the AAMDC cell within the air operations center (AOC), provides an air defense estimate to the AADC. Once the AADC develops the DCA portion of the plan and allocates air assets for various missions, the AAMDC determines whether EAC or corps have sufficient air and missile defense coverage. Based on the CAL/DAL, the AAMDC recommends which assets Army ADA units can protect and integrates that coverage into the AADC/DCA planning process. Coordination between AAMDC and corps brigades deconflict asset coverage prioritization.

(2) The ARFOR allocates resources and assigns tasks to the corps which then can sub-allocate corps assets and assign air and missile defense missions to divisions. In each corps and division main command post (CP), within the G-3 plans section, the air and missile defense coordinator (AMDCOORD), with input from the G-2, the A2C2 cell, and fire support element (FSE), incorporates the air defense mission requirements into the maneuver plan.

(3) The TAAMDCOORD develops and recommends air and missile defense priorities to the commander for approval. Part of the TAAMDCOORD responsibility involves coordinating input from TBMD planning into the offensive counterair (OCA) and interdiction targeting process. The TAAMDCOORD works with the fire support coordinator (FSCOORD) to incorporate the approved priorities into the fire support annexes of the maneuver plan. Coordination between TAAMDCOORD and FSCOORD ensures that the Army TAMD portions of the IADS complement theater OCA plans. The integration and synchronization of OCA and TAMD attack operations by the TAAMDCOORD and FSCOORD prevent mutual interference and maximize unity and economy of effort.

c. Active Air Defense Planning.

(1) Integration and prioritization permit Army ADA units the flexibility to support the commander's concept of the operation. The AADC integrates low-, medium-, and high-altitude air defense systems with airborne counterair resources to optimize DCA.

(2) The appropriate ground force commander will tactically position Army ADA units. Because of their limited numbers, ADA resources are allocated based on specific air and missile defense priorities and commander's intent.

7. Operations

Army ADA forces are either organic to the echelon they are defending or are task organized for the mission. ADA units remain under the operational control (OPCON) of their component commander, assigned headquarters, or as directed by the JFC; they conduct operations IAW the JFC, AADC, and ACA approved and promulgated priorities, plans, and ROE. The AADC/RADC/SADC executes air defense operations through subordinate C2 nodes, such as the CRC/TAOC, or AWACS. The ADAFCO monitors engagement activity to ensure compliance with existing guidance. If this data link to the higher echelon units (HEU) is inoperable, units revert to established ROE. The ADA unit commander is the senior TAMD advisor to the force commander at each echelon.

a. C2 Relationships. The ARFOR commander, AAMDC commander, and corps/division commanders establish C2 relationships for ADA units. ADA forces assigned to corps and lower maneuver elements are under the OPCON of the echelon commander. At EAC, ADA forces are under the ARFOR or AAMDC.

b. Special Command Relationships. Placing the ADA unit under OPCON, TACON, or attachment to another unit can form special command relationships. These control measures create special operational, training, administrative, and logistical relationships among the ADA unit, its parent organization, and the receiving unit.

c. Attachment. Attachment is the temporary placement of a unit within another organization. Subject to the limitations imposed by the attachment order, the commander of the organization receiving the ADA element will exercise the same degree of C2 over attached units as over organic units. This includes administrative and logistical support. The parent ADA unit commander retains the responsibility for administrative functions.

d. Control Chain. Regardless of whom they defend, all battalions, whether in the EAC or corps ADA brigade, are data linked to the established AADC/RADC/SADC control networks. Patriot units are typically data linked to their HEU for ID authority and ABT engagement unless otherwise delegated. TBM engagement authority is decentralized to the fire unit level. Patriot units conduct all IADS operations in accordance with the JFC/AADC/ACA established plans, procedures and ROE. Maneuver Air Defense battalions also operate in accordance with the joint processes, but without electronic engagement control and monitoring. Maneuver Air and Missile Defense (MAMD) battalions are data-linked into the IADS through the battalion air battle management center (ABMOC). However they do use the ACO and the AADC promulgated WCS to guide the conduct of their engagements.

e. Support Relationships. Support relationships define specific arrangements and responsibilities between supporting and supported units (see Table III-6). There are four ADA support relationships.

(1) General Support (GS). An ADA unit in GS provides support for the force as a whole. It is not committed to any specific element of the supported force. It does not support a specific unit within the larger unit's AO.

(2) General Support-Reinforcing (GS-R). An ADA unit with a GS-R mission provides support for the force as a whole and secondarily augments the support provided by another ADA unit. ADA units with a GS-R mission have a primary responsibility to provide support to the force as a whole within a specific area, but must coordinate with the supported ADA unit to reinforce the coverage of assets in the AO.

(3) Reinforcing (R). A reinforcing ADA unit augments the coverage of another ADA unit and strengthens the air defense of the force being defended. A reinforcing ADA unit is positioned to protect one or more of the reinforced unit's priorities as specified by the supported ADA unit commander.

(4) Direct Support (DS). A DS ADA unit provides dedicated air defense for a specific element of the force that has no organic air defense. The supporting ADA unit coordinates its movement and positioning with the supported unit.

Table III-6. ADA Support Relationships

ISSUE	DIRECT SUPPORT	GENERAL SUPPORT	REINFORCING	GENERAL SUPPORT REINFORCING
Who establishes priorities?	The supported commander	The ADA commander who established the support relationship.	The supported commander	ADA commander who established the support relationship
Who positions* ADA fire units?	The ADA commander with the approval of the supported commander	The ADA commander in coordination with local ground commander.	The ADA commander with approval of reinforced ADA commander.	The ADA commander in coordination with reinforced ADA commander.
Who coordinates for terrain used by ADA fire units?	The supported commander	The ADA commander who established the support relationship.	The reinforced ADA commander	The ADA commander who established the support relationship.
With whom should liaison be established?	The supported unit	As required	As required and the reinforced ADA unit	As required and the reinforced ADA unit
With whom should communications be established?	The supported unit	As required	As required and the reinforced ADA unit	As required and the reinforced ADA unit

*The term "positions" specifies the selection of the exact placement of individual fire units within the AO. The parent ADA commander retains responsibility for administration and logistics.

f. ADA Coordination. ADA forces at every level coordinate with each higher echelon and adjacent ADA element in order to provide appropriate C4I to subordinate units. Coordination is essential in disseminating the information necessary to operate an IADS. The ATO, ACO, SPINS, theater air defense and airspace management plans, real-time alerts, air defense warnings, WCS and control data are examples of where this coordination must take place. Coordination also synchronizes the commander's priorities at each level and resolves conflicts of intent. In most theaters, the majority of air defense coordination of interest to ADA occurs among the AADC, JFACC, and the joint force land component commander. Close coordination with the AADC ensures proper integration of Army capabilities into joint air and missile defense efforts. Each component provides a liaison representative to the AADC. The representatives function as the necessary interface among the Service component headquarters. For the ARFOR, this coordination is accomplished by the battlefield coordination detachment (BCD), which collocates part of its staff with the AADC. If the AFFOR or NAVFOR is designated AADC, the TAAMDCOORD plans and conducts operations from the AOC. If the MARFOR is designated AADC, the Marine Corps tactical air command center (TACC) conducts the joint air defense activities.

g. Detect-to-Engage (DTE) Sequence. The DTE sequence is divided into detection, acquisition, identification, engagement, and destruction. The DTE sequence may be different for Maneuver Air Defense and high-to-medium altitude air defense (HIMAD) weapon system engagements. During the

operation, DTE must have the flexibility to respond to changes in mission, enemy, terrain and weather, troops and support available, time available, and civilians (METT-TC).

(1) Detection. ADA systems must discern the presence of TBMs and aircraft that are or may become a threat. Early detection demands continuous surveillance of the battlespace. Detection of TBMs by HIMAD systems is dependent on reliable intelligence on enemy launch locations. TAMD weapon systems will detect the threat while in the active radar surveillance mode; when in the passive mode, they may be cued by external systems. In the case of Maneuver Air Defense weapon systems, the threat is normally detected visually or is cued by surveillance radar or passed from a TAMD unit.

(2) Acquisition. ADA systems must obtain data defining the position of the enemy TBM or aircraft. The data must be sufficiently accurate to provide targeting information to the weapon platforms. Early detection of TBMs is critical to classification and engagement by TAMD systems. Enemy air elements are acquired to determine the threat to defended assets.

(3) Classification and ID. For TBMD, ADA units use classification in lieu of ID. This enables ADA units to classify targets as air-to-surface missile (ASM), CM, or TBM to engage those threatening defended assets consistent with theater ROE. Threats classified as aircraft are addressed separately and are identified in accordance with specifically defined theater identification procedures. In order to prevent fratricide, friendly aircraft must conform to airspace control measures and supplemental procedures established by the AADC and the ACA.

(4) Engagement and Destruction. Air defense elements having detected, acquired, and identified the target tracks, must prioritize them for engagement and destruction. TAMD systems receive engagement authority before engagement of aircraft. For HIMAD systems, manned aircraft engagements are normally centrally controlled. Centralized engagement authority is received from the AADC through the RADC/SADC in coordination with the ADAFCO, although self-defense is never denied.

h. Maneuver air defense units conduct decentralized engagement in accordance with established ROE and AADC weapon control measures. Established ROE specify circumstances permitting and limiting aircraft engagement.

8. Summary

The Patriot, Avenger, Linebacker, and associated C2 provide primary defenses against TBMs and aircraft. These systems can link into a joint data network using a variety of tactical data links and voice communications. The radar systems provide quality track information on friendly, hostile, and neutral tracks. The combination of weapon and sensor systems, integrated with the force, support the air and missile defense mission. The various ADA units, providing support to the ARFOR at all echelons, continuously coordinate their internal and IADS-based operations with each other and their joint counterparts. This facilitates the most efficient use of resources for the IADS.

Chapter IV
MARINE CORPS AIR DEFENSE

1. Introduction

The Marine Corps conducts air defense as part of antiair warfare (AAW). AAW is a US Marine Corps term used to indicate the actions required to destroy, or reduce to an acceptable level, the enemy air and missile threat. The six functions of Marine aviation are: AAW, assault support, offensive air support, air reconnaissance, electronic warfare, and control of aircraft and missiles. This chapter will focus on how the Marine Corps conducts active air defense, and the relevant aspects of control of aircraft and missiles. Air defense combines active and passive measures to protect our forces against attack from enemy aircraft and missiles.

2. Mission

Marine Air-Ground Task Force (MAGTF) air defense assets are employed based on the commander's guidance for supporting the ground scheme of maneuver. The planning and employment will also be based on an intelligence estimate of the threat and MAGTF defended assets.

3. Organization

a. The Marine Corps employs its forces as a task organized MAGTF. The three basic MAGTFs for deployment (largest to smallest) are the Marine Expeditionary Force (MEF), Marine Expeditionary Brigade (MEB), and Marine Expeditionary Unit (MEU). The composition and size of the MAGTF may vary, but the organizational structure will always be a single command element, a ground combat element, an aviation combat element (ACE), and a combat service support element.

b. The MAGTF commander normally delegates the authority for air operations to the ACE commander. The ACE commander exercises authority through the Marine Air Command and Control System (MACCS). The MACCS provides the ACE commander with the means for effective command, coordination, and control of all MAGTF air operations and the effective functioning of the MAGTF IADS.

c. With all MAGTF operations, the MACCS task-organizes its resources based on a mission analysis and various planning factors. Although the MACCS is comprised of personnel and agencies from all three elements of the MAGTF, the ACE performs the majority of functions for AAW. Most MACCS agencies and activities involved in MAGTF AAW are elements of the Marine Air Control Group and include the organizations in Figure IV-1. (Note: Figure IV-1 does not reflect tactical command relationships).

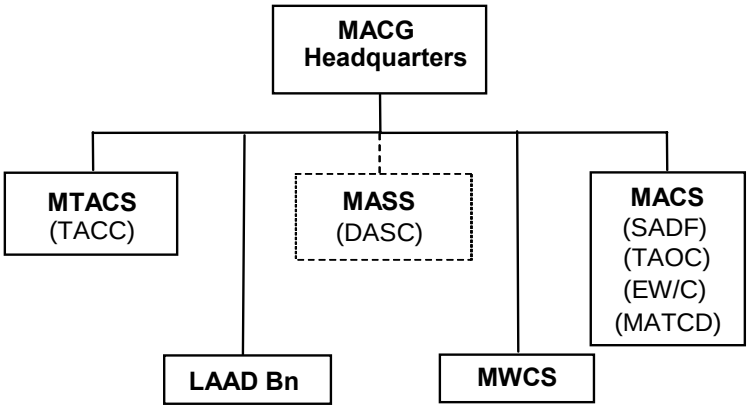

Figure IV-1. Typical Marine Air Control Group Organization

Note: Direct air support center (DASC) and Marine wing communications squadron (MWCS) do not have active air defense roles.

d. Tactical Air Command Center.

(1) The TACC is the senior MACCS agency and the focal point for C2 of MAGTF aviation. The Marine Tactical Air Command Squadron fields the TACC, and is the ACE commander's operational command post. The TACC serves as a facility from which the ACE commander and staff plan and execute MAGTF aviation and aviation support operations. Note: The airspace control functions that it performs are analogous to the Navy Tactical Air Control Center and the Air Force Air and Space Operations Center.

(2) The TACC consists of three mutually supporting, cross-functional operational sections supported by a centralized intelligence organization. The TACC includes the following operational sections:

(a) Current Operations: Executes the daily ATO, and assesses its effectiveness, and reports this to Future Operations. Current Operations is organized by sections, divided into cells to promote the rapid distribution of relevant information necessary to make sound decisions. The cells within Current Operations which are most relevant for air defense include: Airspace Control, Interface Coordination/Track Data, and Air Defense.

- The Airspace Control Cell is responsible for all airspace issues. It will monitor changes to the ACP/ACO/SPINS, informing the rest of Current Operations of those changes as they occur. Additionally, the Airspace Control Cell will coordinate with external agencies for any immediate/current ATO changes to the airspace that the ACE requires.

- The Interface Coordination/Track Data Cell is responsible for ensuring an accurate situational display, data link connectivity, and track data coordination for the MACCS. The Interface Coordination/Track Data Cell includes the Interface Coordination Officer (ICO) who may be assigned the RICO or SICO function.

- The Air Defense Cell is responsible for coordinating air defense within the MAGTF AO. This cell will monitor, supervise, and direct the control of aircraft and missiles (for air defense) by

subordinate MACCS agencies. It will also coordinate air defense operations within the MACCS and with external agencies.

(b) Future Operations: Develops the ATO and prepares orders for the ACE's mission the next day. Ensures assets are available for the execution of the ATO and performs detailed analysis of the enemy order of battle, matching available missions to prioritized targets.

(c) Future Plans: Future Plans is responsible for developing plans and orders for operations 48 hours or more in advance.

(3) Air Combat Intelligence. The three operational sections of the TACC are supported by air combat intelligence, which is the focal point of all aviation intelligence activities supporting the ACE. It produces and disseminates aviation-specific all-source intelligence, including assessments of adversary capabilities and vulnerabilities, target analysis, battle damage assessment and the current status of targets to assist in making changes to the current ATO.

e. Tactical Air Direction Center (TADC).

(1) The commander, landing force (CLF) can establish a TADC while phasing control ashore. The TADC purpose is to coordinate between the MACCS agencies ashore and the commander, amphibious task force's (CATF) Navy Tactical Air Control Center (TACC) afloat. Once the CLF is ashore and ready to assume control of air operations and airspace management functions, the CATF transfers control of all air operations within the amphibious objective area to the CLF. The CLF Marine TADC then becomes the TACC ashore, and the Navy TACC reverts to a TADC. The Marine TADC normally mirrors the TACC in organization, with limited facilities and capabilities.

(2) The essential difference between the TACC and TADC is the volume of responsible airspace and the scope of assigned tasks. A Marine TADC is typically assigned specific tasks pertaining to air operations in the landward sector of the amphibious objective area. In the case of AAW, a TADC may be delegated the authority to coordinate landward sector air defense, offensive antiair warfare (OAAW), or both.

(3) Marine Tactical Air Command Squadron Capabilities and Limitations:

(a) Equipment: Multi-source correlation system (MSCS), AN/TSQ-124, TBMCS, JRE, CTT, GCCS, automated deep operations coordination system (ADOCS), advanced field artillery tactical data system (AFATDS).

(b) TDLs: 1 x Link 11 (UHF or HF), 8 x Link 11 B, Link 16 SatCom/Serial/TCP IP (JRE), NATO Link-1.

(c) Communication: HF, UHF, VHF, SatCom HaveQuick.

(4) The TACC is receive-only on Link-16 due to equipment limitations. The TACC does not have any organic sensors, and is dependent on other elements of the IADS for situational awareness.

f. Sector Air Defense Facility (SADF).

(1) The SADC is the MAGTF commander's air defense battle manager, whose authority is determined by the ACE commander. The SADC is located in the SADF, which is typically collocated with the TAOC. The SADC coordinates and manages all active air defense within his assigned sector. In amphibious operations, the Marine SADC may also be the landing force SADC.

(2) SADC responsibilities focus on the coordination and planning of air defense and OAAW operations in the Marine AOR. The SADF is subordinate to the TACC, and serves as the command element for the TAOC. Representatives from various units of the Marine Air Control Group and the ACE battlestaff also staff the SADF. SADC functions in AAW operations typically include:

(a) Managing air defense resources, including aircraft and surface-to-air weapons within his assigned sector.

(b) Managing airborne tankers.

(c) Recommending air defense control measures to the TACC, ACA, and RADC/SADC as appropriate.

(d) Recommending the employment of AAW resources to support future operations.

(e) Recommending ADWC and WCS changes to the TACC.

(f) Recommending changes to the DAL via the ACE commander to the MAGTF commander.

(g) When delegated, launching alert aircraft or diverting airborne aircraft to engage time critical targets.

(h) When directed by the AADC, functioning as a RADC/SADC for joint air defense operations.

(3) SADF Capabilities and Limitations:

(a) Equipment: AN/TYQ-87, SunSparc workstations, connected via a gateway and fiber optic cable to the TAOC's Tactical Air Operations Modules (TAOMs), Commander's Tactical Terminal (CTT-3) (variable message format (VMF)1, tactical information broadcast service (TIBS)/TRAP Data Dissemination System (TDDS), IBS2), TBMCS Remote Workstation.

(b) Communications and TDL capabilities are dependent on the TAOC, or MWCS support (i.e., HF and SATCOM radios).

Note: Reference the TAOC communication and data link capabilities (below) for the SADC.

g. Tactical Air Operations Center.

(1) The TAOC is part of the Marine Air Control Squadron (MACS). The TAOC is subordinate to the SADC and the TACC, and is the primary AAW agency within its assigned sector. When necessary, the TAOC, along with the SADC and staff, may perform alternate TACC functions (current operations only) for the remainder of the current ATO.

(2) The TAOC provides positive control, management, and surveillance for its assigned airspace. The TAOC detects, identifies, and controls the intercept of hostile aircraft and missiles with aircraft and surface-to-air weapons. It also provides en route air traffic control and navigational assistance for friendly aircraft. The Marine TAOC is similar to the USAF CRC. A typical TAOC has 4 x TAOMs, 1 x AN/TPS-59v3, 1 x AN/TPS 63, and 2 x AN/MSQ-124 air defense control platforms (ADCPs).

(3) A TAOC has two types of organic surveillance radars, located up to two kilometers from the main TAOC site, or at a remote site.

(a) The AN/TPS-59 radar provides long-range, 3D, air surveillance and TBM detection. It has an IFF interrogation capability and is capable of operating in three modes:

- TBM Mode: In this mode, the radar rotates at 12 rpm with the capability of detecting and tracking TBMs at ranges to 400 nm and at altitudes over 500,000 feet without external cueing. In the TBM mode, the AN/TPS-59 also provides launch and impact circular probability ellipses, projected missile trajectory, and missile time to impact.

- Air-Breathing Target (ABT) Mode: In this mode, the radar rotates at 6 rpm with the capability of tracking ABTs at distances out to 300 nm, up to 100,000 feet.

- Combined Mode: The combined mode offers tracking of both air breathing and ballistic missile targets; air breathing targets at distances to 230 nm and altitudes to 100,000 feet; ballistic missile targets at distances to 350 nm and altitudes to 100,000 feet. In this mode, the radar rotates at 12 rpm.

(b) The AN/TPS-63 is a 2D radar, providing mid-range (up to 160 nm) detection up to 60,000 feet. The AN/TPS-63 radar is ordinarily used as an early warning or gap-filler radar.

(4) The TAOC has the ability to deploy a subordinate Early Warning or Early Warning and Control (EW/C) site. Task organized by the TAOC, this site can perform some or all of the functions of a TAOC. A typical EW/C has two organic TAOMs, one AN/TPS-59 (v3) and one ADCP, but may deploy with as little as an AN/TPS-63 and one TAOM.

(5) The TAOC shares the air picture built by its organic radars with data link-equipped aircraft, missile units, other MACCS agencies, and joint air defense agencies and facilities. The TAOC is capable of forwarding data link information between link participants. For units not capable of receiving information via data link, the TAOC can provide voice reports (manual cross tell) for early warning and situational awareness.

(6) To effectively integrate into the MAGTF and an IADS, TAOC directors should conduct liaison and develop habitual working relationships with their counterparts at external agencies. (For example, the TAOC Senior Air Director (SAD) would coordinate closely with the Mission Crew Commander (MCC) at the CRC, the MCC on AWACS, and the Air Defense Cell at the Marine TACC. The Surveillance/Identification Director (SID) would do the same with the CRC Air Surveillance Officer (ASO), the Interface Control Officer (ICO) at the TACC, and the JICO at the JAOC/combined air operations center (CAOC). Developing these relationships allows for a nearly seamless integration of air control agencies and command agencies into an effective air defense system.

(7) TAOC Capabilities and Limitations:

(a) 4 x AN/TYQ-23 (V) 4 x Tactical Air Operations Modules, 2 x AN/MSQ-124 Air Defense Communications Platforms—JTIDS Class 2H AN/URC-107(V)10.

(b) TDLs: 1 x Link 1, Link 4A (12 two-way, 60 one-way), 1 x Link 11 (HF & UHF), using AN/USQ-12 Data Terminal Set, 9 x Link 11B, ATDL-1 (14 links; 9 using a single TAOM), Link 16.

(c) Radios per TAOM: 4 x AN/GRC-171(V)4 UHF-AM/FM, 2 x RT3200E HF, 3 x RT 524/R442 VHF.

(d) Encryption: KGV-8C, KG-40, KG-84C, KY-58, KV-7, KY-68.

Note: The TAOC is movable, not mobile.

h. Marine Air Traffic Control Detachment (MATCD).

(1) The MATCD, like the TAOC, is a detachment of the MACS and supports the TAOC surveillance plan. Each MACS may have multiple MATCDs. The MATCD is the principal MACCS organization responsible for terminal air traffic control. The MATCD uses its organic radar to provide airspace control, management, and surveillance within its sector.

(2) The MATCD contributes to the MAGTF integrated air defense system by exchanging air traffic information to air command and control units via digital data link (Link 11B) and voice reports. The MATCD normally conducts Link 11B with the TAOC. The MATCD is also normally responsible for the activation of a designated base defense zone (BDZ) and providing early warning and cueing to surface-to-air weapons units within the BDZ.

(3) The MATCD air surveillance radar is the AN/TPS-73 Air Traffic Control Subsystem (ATCS). The TPS-73 has a detection range of 60 nm for radar and 120 nm for IFF, to a maximum altitude of 60,000 feet.

(4) MATCD Capabilities and Limitations:

(a) AN/TSQ-131 Command & Communication Subsystem: 2 x shelters, 4 x consoles per shelter (AN/UYQ-34 multi-mode display).

(b) TDLs: Link 4A, Link 11B.

(c) Data: VMF1.

(d) Voice: HF, VHF, and UHF.

(e) Crypto: KY-58, KY-75.

(f) Radars: AN/TPN-22 Precision Approach Radar, AN/TPS -73 Surveillance Radar.

(g) ILS AN/TPN-30 Instrument Landing System.

(h) TACAN AN/TRN-44.

(i) Tower: AN/TSQ-120 ATC Tower, AN/TRC-195 Control Central

Note: The MATCD is only capable of Link 4A and Link 11B.

i. Low Altitude Air Defense Battalion (LAAD).

(1) The LAAD Battalion consists of a headquarters and service battery and two LAAD firing batteries. The LAAD Battalion uses the Stinger missile to provide close-in, low-altitude air defense of forward combat areas, installations, and vital areas. It also provides surface-to-air weapons support for units engaged in special operations and independent operations. The LAAD Battalion may establish a combat operations center (COC) collocated with the SADF and assign a LNO to the SADF crew.

(2) Each firing battery has three platoons with each firing platoon consisting of three firing sections. Each firing section includes five firing teams. Each battalion has 30 man-portable air defense systems—the shoulder fired version of the Stinger missile—and 60 Avenger vehicles. The battalion, batteries, platoons, and sections are task organized with a mix of these weapon systems.

(3) The AN/UPS-3 Tactical Defense Alert Radar (TDAR) is organic to the LAAD Battalion. It has a short-range (10 nm), low-altitude (under 10,000 feet), early warning, alerting, and cueing capability. The AN/UPS-3 is employed at the section level.

(4) LAAD units are normally assigned either in general support (GS) of the MAGTF or in direct support (DS) of a specific unit. Depending on its size, a LAAD unit can provide both GS and DS close-in air defense by task organizing its assets. When operating in a GS role, LAAD units typically receive tasking from the MAGTF commander via the ACE commander and are positioned to provide close-in, point defense of MAGTF vital areas and designated maneuver elements. When operating in DS, LAAD units provide defense of those resources designated by the supported unit commander.

j. Marine Wing Communications Squadron. The MWCS provides communications support and coordination for the ACE and the MACCS. MWCS is responsible for providing the communications backbone which ties together the MAGTF IADS nodes. The MWCS also enables the MACCS to tie into the joint communications architecture.

4. Command and Control

C2 coordinates and integrates the execution and employment of air defense assets after the AADP and ACP/ACO are promulgated and the MAGTF ATO is issued. This ties individual missions and

engagements into an IADS by providing ground-controlled intercept, target assignment, surveillance, and coordination for combat air patrols and surface-to-air weapons. MACCS agencies, positive and procedural control measures, and communications provide the elements necessary for C2 of air defense. Non-organic assets, including airborne early warning and special information systems aircraft, can enhance or augment C2 of MAGTF air defense assets.

a. Command. The ACE commander executes command of all MAGTF aviation. He exercises centralized command and decentralized control authority of MAGTF air defense assets as the tactical air commander from the TACC. The tactical air commander typically delegates the authority for management of air defense assets in the MAGTF air defense sector(s) to the SADC for execution of air defense operations.

b. Control. The ACE commander normally delegates the authority for real time control of air defense assets to the TAOC. The TACC commands and the TAOC executes control of the MAGTF IADS. Control of air defense operations can be decentralized or centralized. The maximum degree of decentralized control is achieved through the establishment of effective procedural control measures, including weapons engagement zones, ROE and return to forces (RTF) procedures. When operating under a decentralized control mode, weapons platforms conduct engagements based on the established WCS and ROE. In a centralized control mode, weapons platforms evaluate targets based on the established WCS and ROE, then request permission to engage the target from the TAOC. Engagements are conducted only upon direction of the competent controlling authority unless the target meets the criteria for self-defense.

c. Communications. Communications provide the means to execute C2 of air defense operations. Communications paths throughout the MACCS are critical to the successful execution of air defense operations. Figure IV-2 illustrates the complexity of the voice and data paths required to successfully employ the MAGTF IADS.

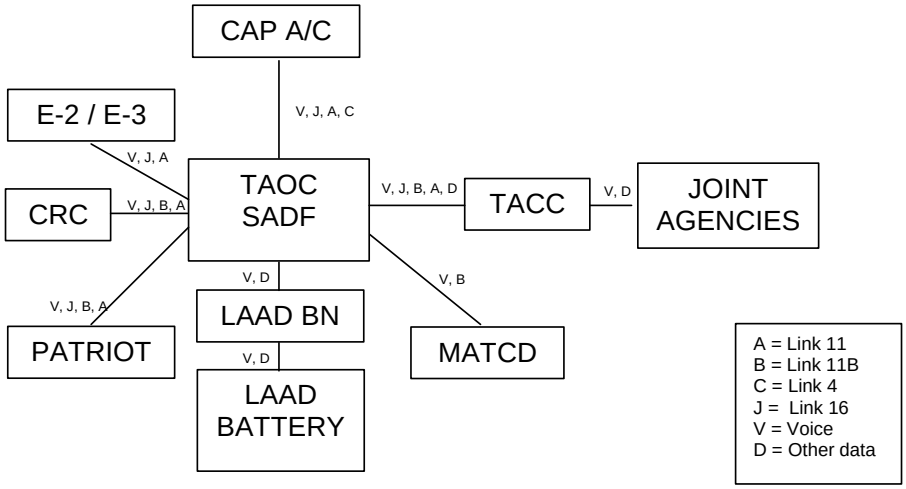

Figure IV-2. Notional MACCS Communications

5. Weapon Systems

The weapons, sensors, and C2 agencies listed in Table IV-1 represent the key elements of the MAGTF integrated air defense system. Obtain additional information through the MAWTS-1 website http://www.tediv.usmc.mil/mawts1/ . Contact the MAWTS-1 C3 Division at DSN 269-3679/Commercial (928) 269-3679.

Table IV-1. MAGTF Integrated Air Defense Weapons, Sensors, and C2

	Platform	*Employment*	*Air-Air/ Surface-to-Air*	*Data Link*	*Radar*	*COMM/SEC*
WEAPONS	**F/A-18C/D Hornet**	AAW- OAAW FAC (A) TAC (A) SEAD (w/HARM) OAS-CAS/DAS Interdiction Night Attack Escort	AIM-120 AIM-7 AIM-9 20 mm gun	Link 4A Link 16	APG-73 AN/AAS-38 FLIR Navigation FLIR	1 AN/ARC-210, UHF, VHF SINCGARS Have Quick KY-67 MIDS
	AV-8B Harrier II+	OAAW SEAD (w/A-G ordinance) OAS CAS DAS Interdiction Night Attack Assault Support Escort	AIM-9 25 mm gun (external)	N/A	APG-65 Lightning II targeting and navigation FLIR	2 AN/ARC-182, UHF, VHF KY-58
	STINGER (MANPAD/ Avenger/ LAV (AD)	LAAD	FIM-92D Stinger Missile	ground-based data link (GBDL)	TDAR.	MANPAD-SINCGARS Avenger- 2 SINCGARS LAV (AD)- HF and SINCGARS
SENSORS	**Platform**	Mission	Type	Band	Range	Altitude
	AN/TPS-59(V)3	Long-range Surveillance (ABT/TBM)	3D w/IFF	L	300/400 nm	100/500k
	AN/TPS-63	Medium-range Surveillance (ABT) Gap-filler/EW	2D w/IFF	L	160 nm	60k
	AN/UPS-3 tactical defense alert radar (TDAR)	Short-range, low altitude EW and cueing	2D	L	10 nm	10k
	AN/TPS-73	ATC surveillance radar	2D w/IFF	S	60 nm pri 120 nm sec	60k

Table IV-1. MAGTF Integrated Air Defense Weapons, Sensors, and C2 (Continued)						
	Agency	*Mission*	*C2 System*	*Data Link*	*Comm*	*Reference*
C C O O M N M & T A R N O D L	**TACC**	Senior agency of MACCS ACE commander CP	Multi-source correlation system (MSCS), AN/TSQ-124 ADCP, TBMCS, JRE, CTT	Link 11 Link 11B LINK 16 NATO LINK 1	HF, UHF, VHF, SatCom Have Quick	(MCWP) 3-25.4
	TAOC	Surveillance and ID Intercept Control Itinerant air traffic control	AN/TYQ-23(v)4, AN/TSQ-124 ADCP	LINK 11 LINK 11B LINK 16 LINK 4A, ATDL-1, NATO Link-1, CTT	HF, UHF, VHF, Have Quick,	MCWP 3-25.7
	MATCD	Terminal Area air traffic control Cueing and control for BDZ	AN/TSQ-131 control and communication subsystem	LINK 11B LINK 4A	HF, UHF, VHF	MCWP 3-25.8

6. Planning and Execution

a. Within the MAGTF, AAW planning supports deep operations to shape the battlespace and achieve battlespace dominance. It supports close operations to engage in decisive combat, and supports rear operations to provide force sustainment. The effective conduct of AAW operations requires integrated planning at all levels and with each element of the MAGTF. The MAGTF commander must outline clearly AAW planning responsibilities within the MAGTF. (Commanders at all levels are responsible for the planning and execution of appropriate passive air defense measures.)

b. The ACE commander directs the ACE staff and subordinate commanders and their staffs to plan air defense to support the MAGTF deep, close, and rear operations. Air defense planning is based on the MAGTF mission, commander's intent, designation of the main effort, air defense priorities, and other guidance. The MAGTF commander may designate the ACE as the main effort to conduct AAW operations, especially during the initial stages of a conflict. This could include offensive AAW and air defense, or other shaping efforts during which AAW could play a significant role.

c. During AAW planning, the SADC and TAOC staffs will normally augment the ACE with several air defense specialists to assist in preparing the MAGTF operations order. Critical decisions, including air defense apportionment and planning to achieve air superiority, must be addressed and answered during this phase. The site selections for air defense agencies (TAOC, LAAD, etc.) are also finalized.

7. Summary

The MACCS exercises command and control of MAGTF air defense assets. The senior agency of the MACCS, the TACC, is responsible for planning and coordinating MAGTF air defense operations with the AADC. The SADC assists in the near-term coordination and management of all air defense resources supporting the MAGTF. The TAOC is the MAGTF principal air defense agency responsible for the real-time execution of air defense operations. The TAOC, through the SADC, coordinates its activities with adjacent sector and regional IADS nodes and shares track data via TDL and voice communications.

Chapter V
NAVY AIR DEFENSE

1. Introduction

Naval forces provide aircraft carrier-based tactical/C2 aircraft, surface combatants, and land-based aircraft that are capable of integrating with other Services' air defense systems in order to defend those assets prescribed by the JTF Commander.

2. Mission

The Navy conducts warfare in three distinct areas: on the surface (to include overland), subsurface, and in the air. The goal is battlespace dominance in all three dimensions. This includes providing an air defense umbrella for friendly assets while simultaneously conducting offensive operations.

3. Organization

The unique nature of maritime operations shapes the organization of Navy assets and affects how these forces fit into the overall military structure. Vast distances, wide dispersion of forces with associated C2 challenges, and the complexities of conducting warfare in a three-dimensional battlespace characterize maritime operations.

a. Chain of Command. The operational chain of command flows from the unified or specified commander, through the naval component commander, to the numbered fleet commanders. Subordinate to the numbered fleet commander, commands are organized by operational tasks (task force, task group, and task unit) to conduct the naval warfare tasks mentioned above. These commands are the basic operating units of naval warfare.

b. Officer in Tactical Command. Under the Composite Warfare Commander (CWC) concept, the officer in tactical command, who is the senior naval commander, has overall C2 of the assigned forces. He is responsible for accomplishing the mission, allocating assigned forces, and providing for safety of the force.

c. Principal Warfare Commanders. In accordance with the CWC (Figure V-1), there are normally five principal warfare commanders that are assigned responsibility for directing actions in each of the naval warfare tasks. They are:

(1) Air defense commander (ADC). In cases where the Navy will be the first air defense C2 asset to arrive on scene, the ADC may assume the role of AADC. Typically, in an established theater, the JFC assigns the role of either a RADC or SADC to the ADC for an over water sector.

(2) Anti-Submarine Warfare Commander.

(3) Surface Warfare Commander.

(4) Strike Warfare Commander.

(5) Information Warfare Commander.

(6) The surface warfare commander and anti-submarine warfare commander may be combined under a single commander referred to as the Sea Combat Commander (SCC). Additional information on the organization and doctrinal employment schemes of Navy forces can be found in Naval Warfare Publication (NWP) 3-56, CWC Manual.

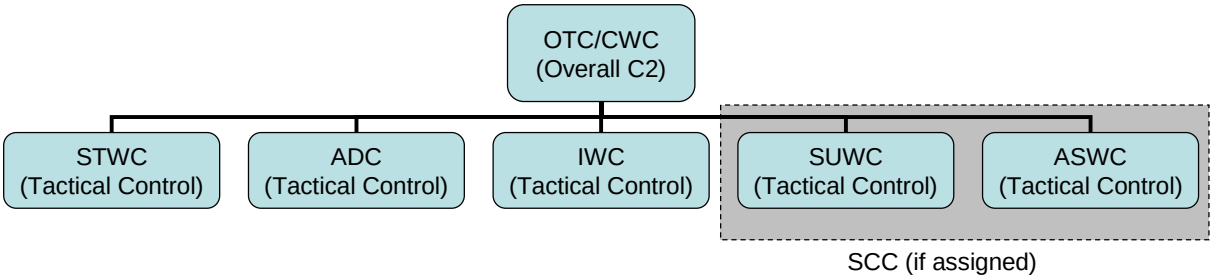

Figure V-1. Naval C2/CWC

4. Command and Control

Navy CWC doctrine is predicated on the concept that individual warfare commanders are trained and equipped to recognize and effectively counter rapidly developing threats, especially in a multi-threat environment with respect to their assigned warfare task. A wide range of options are available to the CWC in delegating command authority to the subordinate warfare commanders. These options range from full delegation of authority to no delegation at all, depending on the threat and tactical situation. Regardless of the authority delegated, the CWC always retains the option of control by negation. Control by negation is a C2 philosophy in which a subordinate commander has the freedom of action to direct and execute those operations necessary to accomplish assigned and implied missions unless overridden by the superior commander.

a. Command Considerations. It is important to note that individual combatants typically conduct simultaneous, multi-warfare missions. For instance, a cruiser, while assigned duties as ADC, may also be actively engaged in Tomahawk Land-Attack Missile (TLAM) strike operations, while simultaneously conducting anti-submarine warfare operations. Because of the C2 complexities created as a result of this multi-mission capability, planners must be acutely aware of Navy asset command relationships and operational constraints when developing task assignments. For example, unit stationing that supports TLAM operations may not be optimal for air defense.

b. Navy Air Defense Precepts. Navy air defense is focused on the protection of high-value assets (HVA) to include the strike group (SG) and assigned joint/multinational forces, against hostile air platforms and weapons (i.e., TBMs, CMs, and aircraft). These functions are controlled by the ADC. Some of the responsibilities of the ADC are to:

(1) Plan the protection of assigned forces against the air threat.

(2) Execute TACON of assigned assets.

(3) Collect and disseminate tactical information and intelligence pertinent to air defense operations.

(4) Coordinate air defense plans and actions with the AADC, RADC, SADC, CWC and other warfare commanders and coordinators.

(5) Assist in coordinating and promulgating ROE and airspace control zones and areas.

(6) Assist in establishing, publishing, and implementing airspace coordination measures.

(7) Manage all SG TDL architectures, as directed/assigned.

c. ADC Control Process.

(1) Under the CWC construct, and when a specific mission has been assigned, the CWC will promulgate general duties, functional assignments, and command guidance using a general operation message (OPGEN). Subordinate warfare commanders, in turn, use either operational tasks (OPTASKs) or operational orders (OPORDs) and associated supplements to deal with specific instructions for their warfare areas.

(2) The Navy-wide air defense plan (OPTASK Air Defense) is the primary reference for guidance in conducting SG air defense. Joint and multi-national operations are conducted in accordance with the appropriate theater guidance. The Navy-wide air defense plan describes the following:

(a) The maritime air defense role.

(b) Missions for SG and independently deployed ships and aircraft.

(c) FEZ/MEZ/JEZ guidance.

(d) Specific air control procedures.

(e) Weapons employment procedures.

(f) Air surveillance schemes.

(g) Targeting priorities.

(h) ID criteria.

(3) Specific SG air defense plan supplementary messages or annexes are promulgated to provide more detailed guidance on such items as SG ID policy;, TBM operations,; cooperative engagement capability (CEC) operations and TDL employment procedures.

d. Practical Integration. Each major surface air defense asset is equipped with a combat system that consolidates the input of its shipboard sensors (radar, IFF, sonar, electronic signal intercept, and so forth) and displays this information to decision makers for action. Most naval surface combatants are capable of Link 11 and Link 16 information exchange. Some naval assets are capable of satellite Link 11 and Link 16 operations. All E-2s are Link 11 and Link 16 capable. All F/A-18 E/F, F-14 D, as well as some F/A-18 C/Ds are Link 16 capable.

(1) Joint Employment.

(a) In a joint environment, the ADC may be assigned the role of RADC or SADC by the AADC, coordinating with Navy or joint assets to provide a CTP to the AADC. In the pursuit of a CTP, the ADC optimizes asset employment to maintain track integrity, correctly identify friendly aircraft operating in the air defense region, and positively identify all aircraft operating in the classification, identification, engagement area before they enter the vital area. The ADC also has authority to assign capable assets to perform duties as an air control unit (ACU). Aegis cruisers (CG), Aegis destroyers (DDG), and airborne early warning aircraft are typically assigned duties as an ACU. CV/CVN and LHA/LHD platforms are also ACU-capable.

(b) Link 16 is the Navy's primary data link. However, several naval platforms will never upgrade to Link 16. Other surface assets such as Oliver Hazard Perry-class frigates (FFG) and Spruance-class destroyers (DD) will continue to rely on Link 11. It is also important to consider whether the platform is a Model 4 or 5 combat system as well, since there are significant differences which may impact the overall TDL architecture.

5. Weapon Systems

The goal of Navy air defense is to protect HVAs and other defended assets. Navy surface platform capabilities are listed in Table V-1. Navy aviation platform capabilities are listed in Table V-2.

See http://www.phdnswc.navy.smil.mil/ (Naval Surface Warfare Center, Port Hueneme Division) for detailed Navy air defense systems capabilities and limitations.

Table V-1. Navy Surface Platforms

Ship Type	Primary Role	Air Search Radar Systems	Weapon Systems	ID Capabilities	Data Link Capabilities	Comms Capabilities	Air Defense Capabilities /Air Assets
Amphibious Command Ship (LCC) Numbered Fleet Command	C2	N/A	CIWS	IFF	Link 11 Satellite Link 11 Link 16 Satellite Link 16	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF TCP/IP	AADCS Module* JAOC (TBMCS)
Aircraft Carrier (CV), Aircraft Carrier, Nuclear (CVN)	Fixed-Wing Aircraft Operations	AN/SPS-48E (3D) AN/SPS-49 (2D) MK23 TAS SPQ-9	NSSMS CIWS RAM	IFF CV Auto ID CEC * SSES SLQ-32 SLQ-20	Link 11 Satellite Link 11 Link 4 Link 16 Satellite Link 16 ADSI	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF TCP/IP	48 x Fighters (F-14 / F-18) 4 x E-2 ACU (TBMCS)
Guided Missile Cruiser (CG)	SG Air Defense Missile Defense	SPY-1B (3D) SPQ-9	TLAM SM2 BLK 3/4 2 x 5 in 54 CIWS	IFF CEC * SSES Aegis Auto ID NCTR * SLQ-32 SLQ-20 *	Link 11 Satellite Link 11 Link 4 Link 16 Satellite Link 16	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF TCP/IP	ACU
Guided Missile Destroyer (DDG)	Air Defense Missile Defense	SPY-1D (3D)	TLAM SM2 BLK 3/4 1 x 5 in 54 CIWS	IFF CEC * SSES Aegis Auto ID SLQ-32 SLQ-20	Link 11 Satellite Link 11 Link 4 Link 16 Satellite Link 16	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF* TCP/IP	ACU
Guided Missile Frigate (FFG)	Surveillance	AN/SPS-49 (2D)	1 x 76 mm Gun CIWS	IFF SLQ-32	Link 11 Satellite Link 11	HF UHF/VHF HAVEQUICK UHF-SATCOM TCP/IP	
Spruance Destroyer (DD)	Anti-Sub / Surface	AN/SPS-40 (2D) MK-23 TAS	TLAM NSSMS RAM * 2 x 5 in 54 CIWS	IFF SLQ-32	Link 11 Satellite Link 11	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM TCP/IP	
Amphibious Helicopter Assault Ship (LHA)	Sea/Air Landing Force Assault	AN/SPS-48E (3D)	RAM CIWS	IFF SLQ-32	Link 11 Satellite Link 11 Link 4 Link 16 Satellite Link 16	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF TCP/IP	ACU 6 x AV-8B (TBMCS)
Amphibious Helicopter Dock Ship (LHD)	Sea/Air Landing Force Assault	AN/SPS 48E (3D) MK-23 TAS	NSSMS RAM CIWS	IFF CEC * SLQ-32	Link 11 Satellite Link 11 Link 4 Link 16 Satellite Link 16	HF EHF UHF/VHF HAVEQUICK UHF-SATCOM SHF TCP/IP	ACU 6 x AV-8B (TBMCS)

Note: * Only some assets have this capability.

Table V-2. Naval Aviation Air Defense Weapon Systems							
Platform Type	**Primary Role**	**Air Search Radar Systems**	**Weapon Systems**	**ID Capabilities**	**Data Link Capabilities**	**Comms Capabilities**	**In-flight Refueling Capable (Drogue)**
E-2C Group II / Hawkeye 2000	Air Surveillance and Aircraft Control	APS-145	None	IFF ES-capability	Link 11 Link 4 Link 16	HF/HF SIPRNET* UHF/VHF UHF-SATCOM Link 16 FTM HAVEQUICK	No
F-14 A/B/D	Air Intercept, Strike	AWG-9 (A/B) APG-71(D)	AIM-7 AIM-9 20mm	IFF infrared search and tracking (IRST)/NCTR (D- only) TCS/FLIR	Link 4 Link 16 (D-only)	UHF/VHF HAVEQUICK	Yes
F/A-18C/D	Air Intercept, Strike	APG-65/73	AIM-120 AIM-7 AIM-9 20mm	IFF * NCTR FLIR	Link 4 Link 16 *	UHF/VHF HAVEQUICK	Yes
F/A-18E/F	Air Intercept, Strike, Tanking	APG-73	AIM-120 AIM-7 AIM-9 20mm	IFF NCTR FLIR	Link 4 Link 16	UHF/VHF HAVEQUICK	Yes
E/A-6B	EW Communications	None	None	ES	Link 4	UHF/VHF HAVEQUICK	Yes
S-3B	Tanking ESM Strike	None	None	IFF ES	Link 11 Link 4 (1-way)	HF UHF/VHF HAVEQUICK	Yes
EP-3E	ES / Communications	None	N/A	IFF ES Comm-ID	Link 11 Link 16 *	HF UHF/ VHF HAVEQUICK UHF-SATCOM SHF *	No
AV-8B	CAS, Air Intercept (Limited), Strike	APG-65 *	AIM-9 25 mm	FLIR *	None	UHF/ VHF HAVEQUICK	Yes
Note: * Only some assets have this capability.							

6. Planning

a. The ADC, in coordination with the strike group and air wing staff, will conduct primary air defense planning afloat. CV/CVN, LHA/LHD, and amphibious command ship (LCC) have significant planning capabilities to include a very robust intelligence and cryptographic collection capabilities. The CV/CVN and LHA/LHD are equipped with TBMCS and a host of other tools for collaborative planning. These platforms provide liaison officers to the AADC and can host LNOs from other services.

b. The CV/CVN and LCC have a capability to perform air command and control functions. As the complexity and scale of the operation expands, these functions will most likely be transferred to a more robust command organization such as an AOC. However, the CV/CVN, CGs, and DDGs can continue to provide considerable support as RADC/SADC and as an interface control officer (RICO/SICO).

c. Planning Considerations.

(1) CVW planning is typically accomplished on a 72-hour timeline that coincides with the ATO production cycle. Aircraft operations are usually conducted in a cyclic manner, with launches and recoveries typically on a 1+15 (75-minute) or 1+30 (90-minute) schedule. A typical 1+30 cycle consists of 15-20 sorties exclusive of those aircraft whose endurance allows them to fly double cycles. Shorter cycles limit the number of aircraft that can be launched and recovered. Longer cycles allow for larger launches but increase requirements for airborne tanking. The principal constraint in sustained carrier flight operations is flight deck personnel manning. Units can sustain 14-16 hour fly days with careful management. With a single CV/CVN, 24-hour carrier operations are not possible. Such operations will require at least two CV/CVNs.

(2) Fighter aircraft remaining airborne for more than a single cycle require in-flight refueling. Units can accomplish this either organically, using limited air wing assets such as the S-3B or F/A-18 E/F, or inorganically, utilizing drogue-configured joint/coalition tanker assets (i.e., KC-10/KC-130/KC-135/VC-10).

d. Planning Considerations for Surface Ship Stationing. ADU platforms may be used in area, point, or self-defense roles. Aegis platforms have limited TBM-tracking, reporting and cueing capability and a TBM engagement-capability is under development. Coordinate with Navy LNO to determine operational limitations when conducting TBM related missions.

e. Area Air Defense. Dependent on the threat, an ADU will be stationed along the expected threat axis to conduct engagements against airborne targets. Aegis platforms are the only ships capable of performing this mission.

(1) Point Defense ("Shotgun"). This unit is tasked with guarding an HVA. Typically, the shotgun unit will remain in close proximity to the HVA.

(2) Self-Defense. Most naval ships have some type of self-defense capability.

f. REDCROWN/GREENCROWN. An ADU-capable ship is assigned to identify all aircraft approaching the carrier strike group (REDCROWN), or expeditionary strike group (GREENCROWN).

7. Operations

a. The Naval SG operates everywhere from open-ocean or "blue-water" to the littorals. In the open-ocean, the Navy's primary air defense mission is to protect SG assets, utilizing defense-in-depth. The Navy will typically operate with a JEZ, versus the traditional MEZ/FEZ. When operating in the littorals, the Navy SG may take on additional air defense responsibilities, to include the protection of units ashore.

b. To illustrate the defense-in-depth concept, a typical DTE sequence begins with a long-range sensor detection of a threat from an asset such as an E-2 or CG/DDG. Track information is passed to interceptor aircraft under E-2 or CG/DDG control to confirm identification and engage, if warranted. If fighter assets are not available, the next weapon system of choice would be a long-range Standard missile. Final engagement opportunities include self-defense weapons such as 5-in/76 mm gun, the Close-in Weapon System (CIWS), Rolling Airframe Missile (RAM), or NATO Sea Sparrow Missile System (NSSMS).

8. Summary

The Navy brings a robust air defense capability to the fight. Most naval air assets are allocated to the JFACC and very few are retained for direct support of the SG at sea. Navy surface combatants are multi-mission capable and can/do provide self-protection, protection of the HVA, and simultaneously perform a host of other warfare functions. TDL-capable ships and aircraft can provide information on overland tracks while maintaining the over water picture. Although specific capabilities vary, all naval SGs arrive in theater prepared to conduct integrated air defense operations.

Chapter VI
AIR FORCE AIR DEFENSE

1. Introduction

The Air Force Theater Air Control System (TACS) is constructed on the tenet of centralized control and decentralized execution. It is responsible for offensive, defensive, and support of air and space operations in the theater and is configured to meet the needs of the specific theater of operation.

2. Mission

Air defense is a significant part of the greater Air Force mission in theater. The mission of theater air defense is to gain and maintain air superiority over designated friendly territory and protect designated friendly assets. Air superiority allows offensive air, land, and sea-based operations to proceed without prohibitive interference by the enemy air and missile systems. Elements of air defense include planning and execution of surveillance, identification, command and control, weapons employment and integration with joint and combined air defense capabilities.

3. Organization

The USAF organization for planning and executing air defense is fairly simple, although embedded within the organization responsible for all air and space operations. The AOC serves as the senior element of the TACS and translates guidance and directives into actionable tasking (the ATO/ACO etc.). Subordinate elements such as the CRC, the E-3 and the Air Defense Sectors (for air defense within the CONUS, Alaska, and Hawaii) function as the TACS C2 execution nodes.

4. Command and Control

The Commander, Air Force forces (COMAFFOR) exercises centralized control through the AOC and decentralized execution through the subordinate elements of the TACS. When the Commander, Air Force forces (COMAFFOR) is designated JFACC, the AOC becomes the core of the JAOC. The JFACC normally assumes responsibility for airspace control and air defense unless separate ACA and AADC are designated.

a. Air Force Air and Space Operations Center. The AOC is led by an AOC director and has five divisions with subordinate core teams, and numerous specialty and support teams and liaison elements. Figure VI-1 depicts the approved JAOC organization that is used when the COMAFFOR is designated JFACC.

(1) The AOC director is focused on planning, coordinating, allocating, tasking, and monitoring execution, and sustaining and assessing air power operations in the AOR/JOA based on commanders' guidance. It is the director's responsibility to ensure the AOC functions necessary to complete air and space planning and execution are conducted in a timely and efficient manner.

(2) Defensive specialists in the strategy and plans divisions, in coordination with the ISR division and liaison elements and other components produce the planning and guidance documents related to air defense and provide input to airspace control, communications, sensor, and command and control architectures which are common to defensive and offensive operations.

(3) The Defensive team within the combat operations division (COD) monitors and directs the execution of the defensive portions of the ATO and performs air and missile defense duties, including alerts and warnings administration, IAW guidance.

(4) The COMAFFOR may designate alternate command elements, stationed at ground facilities or onboard airborne platforms, to assume part or all of COD duties.

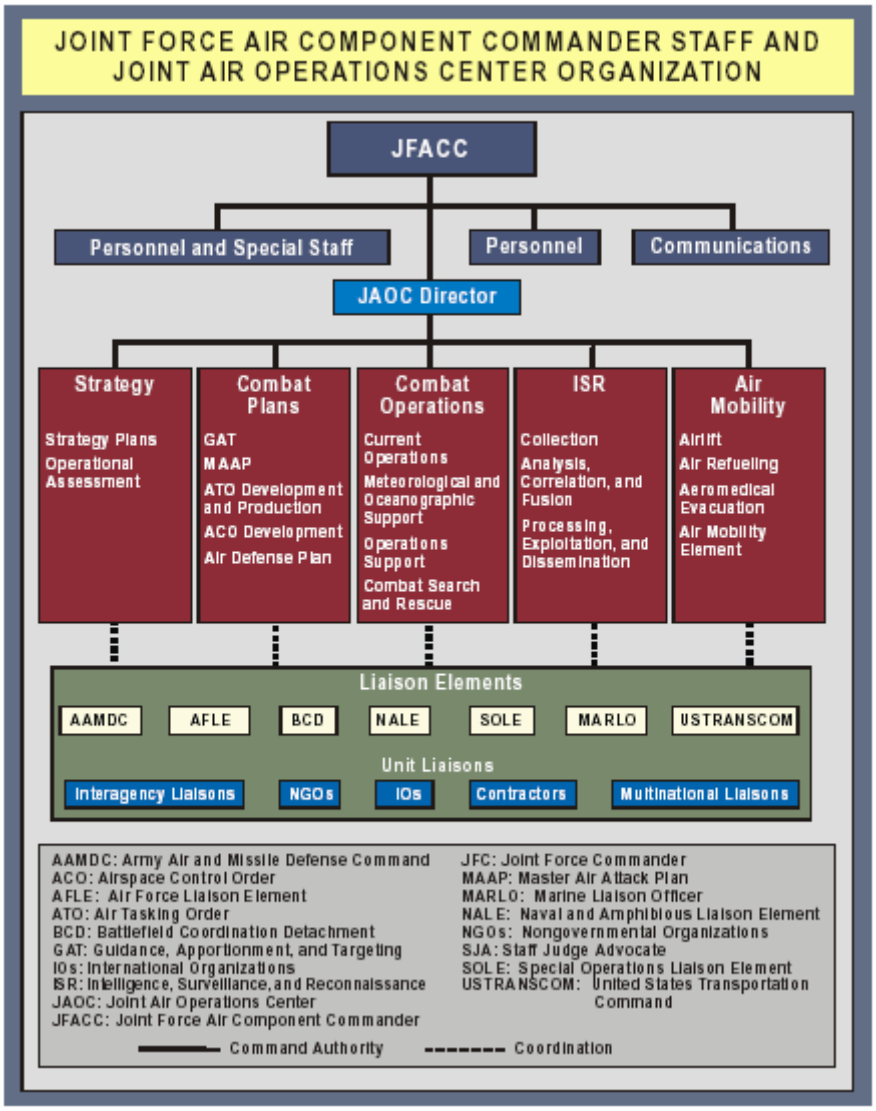

Figure VI-1. JAOC Organization

b. Control and Reporting Center. The CRC is a C2 asset that supports the COMAFFOR requirement for tactical level command and control, commonly referred to as air battle management. It is the Air Force's most forward link in the Joint Battle Management Command and Control family of C2 systems. It is capable of effective integration vertically with operational level C2 systems, and horizontally with other tactical C2 elements (see Figure VI-2). The CRC is charged with decentralized execution of the air defense and airspace control functions. Within its operational area, the CRC may be employed alone or in combination with other elements of the TACS C2 architecture. The CRC may be assigned responsibility as a sector air defense commander (SADC), and is normally designated Sector ICU. The CRC is capable of conducting airspace control, weapons control, surveillance, and aircraft identification. When directed by the JAOC, the CRC may be used as the conduit with Service components and multinational forces to exchange airspace management and air defense data from C2

systems via tactical data links. Through the use of TDLs, the CRC is capable of receiving and transmitting data link information from the various C2 platforms established in the MTN network (see Table VI-I). The CRC meets mission requirements using the concept of core and follow-on unit type codes (UTC), which may be deployed incrementally or simultaneously depending on the COMAFFOR desired effects. Each UTC is tailored to meet theater specific objectives and provides flexibility to support various contingencies. A CRC consists of four core UTCs:

c. Interface Coordination Cell (ICC) . The ICC provides the JFACC with tactical digital information link capability (Link 11/11B/4/16, ATDL-1, NATO Link 1). The ICC consists of at least one operations module (OM), one JTIDS module (JM) and associated support equipment.

d. Deployable Radar (DR). The DR consists of a radar and associated communications and support equipment. It can be collocated with the CRC, or operate from a remote location.

e. Wide Area Surveillance and Identification (WASID). The WASID provides the JFACC with wide area detection, tracking, identification, reporting, and warning of air breathing and non-air breathing threats. The WASID consists of at least two OMs, two radar sets, and associated support equipment.

f. Air Battle Execution (ABE). The ABE consists of at least four OMs, one radar set, and associated support equipment. This UTC provides the JFACC a decentralized ABE (decentralized management, Army air defense artillery, naval surface vessel interface) and weapons control capability.

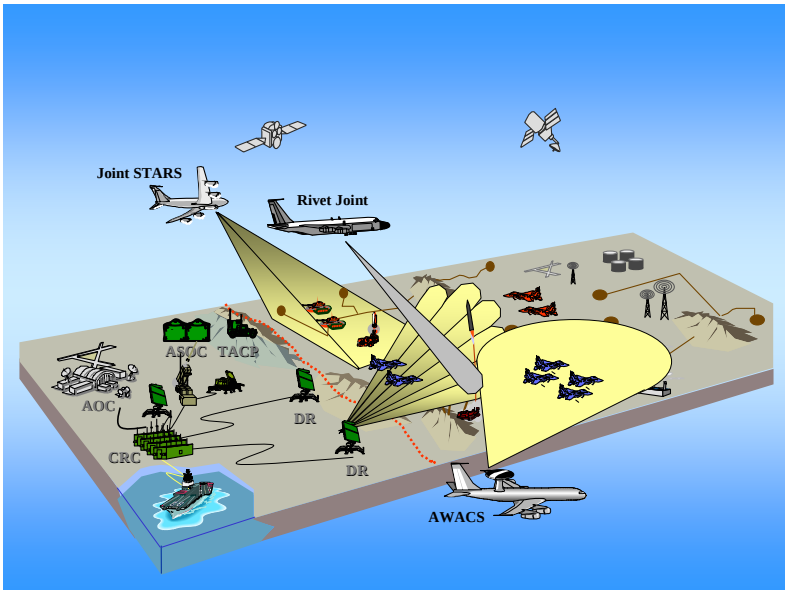

Figure VI-2. Notional Diagram of the USAF Theater Air Control System

Table VI-1. Typical CRC Equipment		
Major Equipment	Description	Function
TYQ-23 Operations Modules (OMs)	C2 Operator Consoles	ATO Execution Datalinks Management, Surveillance, ID
AN/TPS-75 Radar	Mobile radar equipment	Local or remote mode radar application
AN/TSC-147	JTIDS Module	JTIDS connectivity
AN/TSC-100A	SHF SATCOM	Tactical data links
AN/TRC-170	Communications	Data/Voice Nets/Links, BLOS with relay
AN/TER-170	Line-of-sight microwave	Remote sighting of radios
AN/TTC-42	Automatic Telephone Central	Telephone Switch
AN/TRC-175	Remote Radio Secure Voice System	Remote operations of radar and radios
AN/TSQ-146	Multiplexer Terminal	Communications Switching Node
Note: See AFTTP 3-1, Vol 26, for further details.		

g. Air Defense Sectors. Within the CONUS, Alaska, and Hawaii, the functionality of the CRC is accomplished through the Air Defense Sector (ADS). The ADSs are fixed facilities that provide airspace control, weapons control, surveillance, and aircraft identification using Federal Aviation Administration (FAA) and Department of Defense (DOoD) radars linked to an automated computer processor. The ADS is equipped with tactical data links and secure communications. For further information and specific detail on ADS capabilities and limitations, see FM 3-01.1/NTTP 3-26.1.1/AFTTP(I) 3-2.50, *Multi-Service Tactics, Techniques, and Procedures for Air Defense of the United States*.

h. E-3 B/C AWACS. AWACS is a highly mobile and flexible surveillance and C2 capable platform. The E-3 carries pulse and pulse Doppler surveillance radars, IFF interrogator/receiver and a passive detection system which provides limited electronic warfare support. The aircraft carries a varied suite of UHF, VHF, SATCOM, and HF radios as well as tactical data links (J, A, and C). The AWACS crew can be tailored to perform specific duties as required and can host Airborne Command Element (ACE) personnel.

(1) The E-3 may be the first USAF TACS element on scene and function autonomously or under the TACON of other components in the early period of a contingency. In a mature theater, AWACS operates as a part of the TACS architecture.

(2) In planning the tasking for AWACS, consideration must be paid to the limits of crew size and communications capability to ensure appropriate span of control and avoid over tasking. AOC planners

coordinate among all mission areas requiring AWACS support, as well as with the AWACS unit, to prioritize duties and ensure adequate coverage is provided. During execution, AOC defensive team members must be sensitive to the multi-task nature of the AWACS when considering altering an orbit location or defensive tasking.

i. Theater ISR. Defensive planners coordinate the services of various ISR platforms, typically including Rivet Joint and Senior Scout, to assist in combat identification. ISR capabilities are usually in short supply and tasked to perform diverse duties supporting various missions and agencies within the theater. As with AWACS, careful coordination during planning and awareness of the greater mission during execution are required.

5. Weapons Systems

Table VI-2 is a matrix illustrating air and ground operations capabilities, while Table VI-3 highlights additional capabilities for AWACS and CRC.

Table VI-2. Air and Ground Operations Capabilities Matrix

Platform	COMM/SECURE	Data Link	Aircraft Armament	RADAR	AAI Capable	References
F-15C	UHF/Yes	Link 16	AIM-120/7/9	A/A (air-to-air)	yes	AFTTP 3-1 Vol. 4
F-15E	UHF/Yes	Link 16	AIM-120/7/9	A/A	yes	AFTTP 3-1 Vol. 17
F-16C	UHF/VHF/Yes	Block 30 F-16 SADL equipped	AIM-120/9	A/A	no	AFTTP 3-1 Vol. 5
F-16CJ	UHF/VHF/Yes	Link 16	AIM-120/9 HARM	A/A	no	AFTTP 3-1 Vol. 5
F-16ADF	UHF/VHF/HF/Yes	n/a	AIM-120/7/9	A/A	no	AFTTP 3-1 Vol. 5
E-3	UHF/VHF/HF/ SatCom/Yes	Link 11, C, J	n/a	A/A	yes	AFTTP 3-1 Vol. 15
AOC	UHF/VHF/HF/SatCom/Yes	Link 11, B	n/a	n/a	n/a	AFTTP 3-1 Vol. 26
CRC	UHF/VHF/HF/SatCom/Yes	Link 11, B,C, J, ATDL-1	n/a	G/A	yes	AFTTP 3-1 Vol. 26
ADS	UHF/HF/SATCOM/ Yes	Link 11,B, J	n/a	G/A	yes	AFTTP(I)3-2.50

Note: DCA weapons systems assigned to the particular AOC may include a variety of defensive and dual mission capable aircraft as well as airborne C2 platforms.

Table VI-3. Voice/Data Capability (E-3 B/C and CRC UTCs)					
CRC UTCs					
Frequency	***Equipment***	***E-3B/C***	***ICC***	***WASID***	***ABE***
UHF	Number	13	4	8-12	16-20
	HQ	4	4	8-12	12-16
	Secure	10	4	8-12	16-20
VHF	Number	3	3(5)	6-9(5)	12-15(5)
	AM	2	--	--	--
	FM	1	3(5)	6-9(5)	12-15(5)
	Secure	--	3	6-9	12-15
	SINCGARS	--	3(5)	6-9(5)	12-15(5)
HF	Number	3	2	4-6	8-10
	Secure	1	2	4-6	8-10
UHF SatCom	Number	3	3(5)	6-9(5)	12-15(5)
	Secure	2	3	6-9	12-15
LINK 11	KG-40	1	1	1	1
LINK 11B	KG-84	--	7	9	9
LINK 4	-	--	12	12	12
LINK 16	--	1	1		
NATO LINK 1	KG-84	--	1	1	1
ATDL-1	KG-84	--	7	14	14
(1) Radios internal to CRC Operations Modules (OM). CRC possesses capability to add multiple UHF/VHF/HF/UHF station radios externally. (2) ICC: 1 OM/1 JTIDS Module (3) WASID: 2-3 OMs/1 TPS-75 (4) ABE: 4-5 OMs/2 TPS-75 (5) Each OM has three positions for VHF radios; SINCGARS and UHF SATCOM use VHF positions; for each SINCGARS and UHF SATCOM added internally, one VHF FM must be removed.					

6. Planning

AOC personnel are responsible for planning, directing the execution of, and assessing air and space operations and directing changes as the situation dictates. Primary AOC functions with regard to air defense are:

a. Develop air operations strategy and planning documents that integrate air, space, and information operations to meet commanders' air defense objectives and guidance.

b. Task and direct the execution of day-to-day air operations, coordinate and deconflict weapons employment, and integrate the total air effort.

c. Incorporate component airspace requirements for air defense systems and develop airspace control measures (i.e., missile engagement zones) for inclusion in the ACO and coordinate airspace control activities.

d. Provide overall direction of theater air defense, (includes both air and missile threats).

e. Conduct operational level assessment to determine air operations effectiveness.

f. Coordinate with other IADS participants in the production of defensive sections of the ATO and ATO changes and other periodic planning documents.

g. Plan and task various missions, including air refueling, which support DCA and C2 aircraft.

h. Develop and disseminate the OPTASKLINK and TACOPDAT.

7. Operations

a. Force Operations. The COMAFFOR directs the planning and execution of all capabilities/forces made available for a given ATO. The combat operations division (COD) of the AOC is responsible for directing and monitoring the execution of the ATO and processes recommended changes to the ATO. received from any source. It is also charged with coordinating and deconflicting those changes with the appropriate components and control agencies.

b. The COMAFFOR may delegate C2 authority to ground or airborne C2 platform mission commanders. It is essential, however, to notify the COD section of all redirected missions.

8. Integration

a. Missile defense systems present an integration challenge for the AOC. For example, some Army ADA units may be tasked to defend entities on the DAL, while others are tasked to support land component maneuver forces. For units tasked against the DAL, the chain of command proceeds from the COMAFFOR through the SADO in the AOC to the CRC (or AWACS). However, the chain of command for ADA units in support of maneuver forces stems from the maneuver force commander.

b. The best way of achieving unity of effort (for land based missile defense systems) is through the ADAFCO (see Chapter II for description). The SADO coordinates with maneuver units through the BCD (AAMDC representative, if present) (see Figure VI-3). Because coordination between components is critical, clearly articulate it in the AADP (to include engagement priorities and communications channels). The SADO needs awareness of the location and movement of the maneuver ADA units to avoid fratricide and to promote effective airspace control. The AADC must establish procedures for routing fixed-wing aircraft around active air defense sites. In addition, the AADP, SPINS, and ACO must specify procedures for operating near and around active air defense sites.

Note: The coordination conduit for Marine Corps ADA units is the Marine liaison officer (MARLO).

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c. The ADAFCO needs awareness of the location and movement of the maneuver ADA units for effective employment of missile defense systems. Maneuver units require timely updates to the ATO, ACO, and SPINS in addition to dynamic updates to avoid fratricide.

d. Navy air defense units (i.e. AEGIS Cruiser) may be capable of providing DAL coverage while simultaneously providing fleet defense. If dual tasked, any changes to the ability to meet the DAL tasking should be identified to the SADO through the Naval Amphibious Liaison Element (NALE).

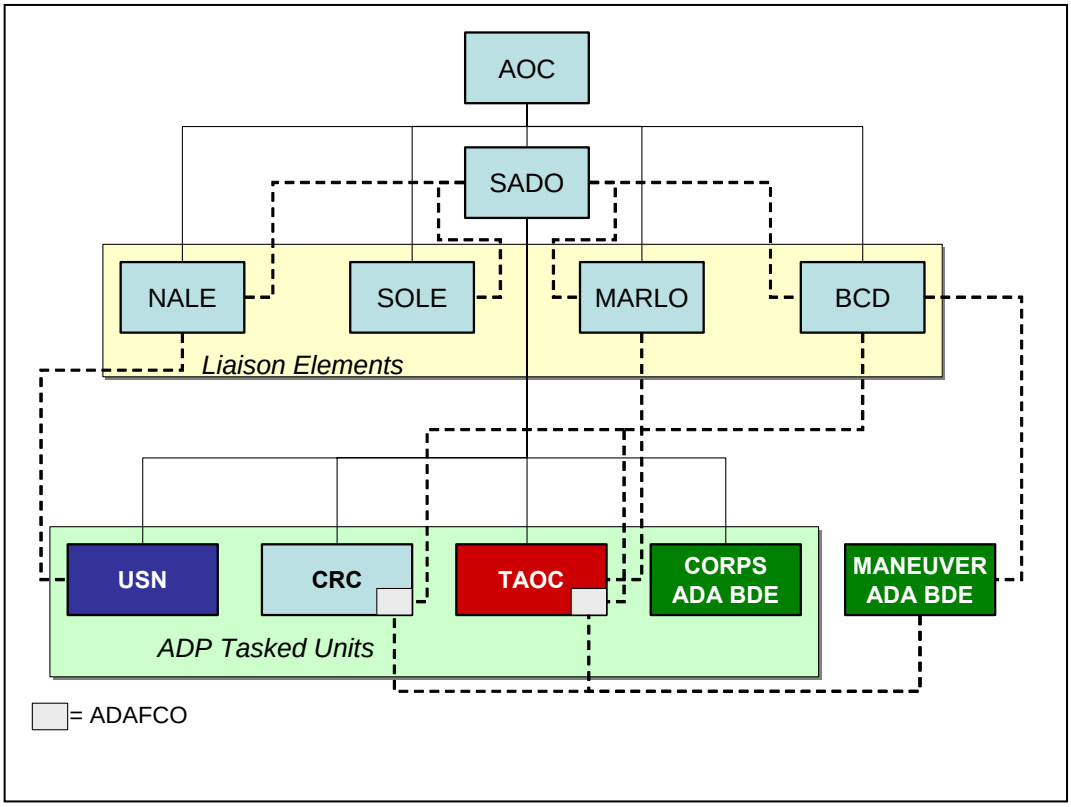

Figure VI-3. SADO Integration

9. Summary

a. The functions of airspace control and air defense and their attendant responsibilities are normally integrated under a single commander in order to provide unity of effort for air operations. These functions include developing, coordinating, and publishing airspace control procedures, operating the airspace control system, and integrating the joint force air defense effort. The AOC is structured to operate as a fully integrated facility and staffed to fulfill all responsibilities. Two common AOC functions are combat plans (future joint air operations) and combat operations (execution of the daily ATO).

b. The Air Force provides air defense by conducting offensive and defensive counterair operations throughout the operational area, while conducting other missions and support activities. This is primarily done through the planning and execution of counterair operations through the USAF TACS.

Appendix A
MULTINATIONAL CONSIDERATIONS

1. Multinational Force Commander

The Multinational Force (MNF) commander may designate an AADC to ensure an integrated defense effort by the MNF. Because of the interrelationship between airspace control, air defense, and other air operations, the ACA, AADC, and air component commander duties are normally performed by the same person.

2. Multinational operations planning considerations

a. Host Nation (HN) Training Levels and Air Defense Order of Battle (OB). When required to operate as part of a MNF, understanding types and numbers of participating nation's air defense systems and capabilities is important. Operations may or may not include integration with host nation air defense systems, ATC, and C2 architecture.

b. Interoperability. Always consider integrating US and foreign nation weapon systems in order to optimize defense design. Several countries own and operate US designed weapons systems such as Patriot and Hawk air defense systems. However, just as US systems must upgrade, so must foreign government systems. Based on foreign military sales case agreements, US forces going into a multinational theater may find incompatibilities with like systems. Therefore, planning and conducting interoperability training with foreign governments becomes even more critical.

c. Disclosure of Critical Air Defense Information. When operating as part of a MNF, US forces rely on classified sophisticated intelligence and operations databases. Although sharing this information is critical to successful conduct of the mission, much of this information is not usually releasable to foreign governments. For air defense, this critical information includes accessibility to the different data links. The US forces commander must carefully consider national disclosure policy guidance, along with intent and concept of the operation when determining whether to request release of additional source information to specific countries. In some instances, during the execution of combat operations, the commander may have to make a determination to release previously non-disclosed information if release of the information serves to protect the interests or safety of US forces.

d. CID. The Mark XII IFF/SIF system is used by US forces (Modes 1-4). When conducting multinational operations, the MNF will usually only be equipped with some of these Modes. US forces must work closely with the MNF to establish a combination of procedural and positive means for effective combat identification when the MNF forces are not capable of the full range of Mark XII Modes (refer to CID in Chapter 2). Due to the recent NSA decertification of the Mark XII Mode 4 system [DIRNSA message 081811Z Oct 03] ID planners should refer to FM 3 01.61/MCWP 3-25.11/NTTP 6-02.4/AFTTP(I) 3-2.39, *Multi-Service Tactics, Techniques, and Procedures for Mk XII IFF Mode 4 Security Issues in a Joint Integrated Air Defense System.*

e. ROE. US forces operating in a multinational environment must follow Chairman Joint Chiefs of Staff Instruction (CJCSI) 3121.01 Change 1, Standing Rules of Engagement for US Forces. The JFC will normally be asked to submit additional supplemental ROE for approval by the Joint Staff. In many cases, commanders of deployed member forces may lack the authority to speak on behalf of their nation in the ROE development process. The force commander must reconcile differences as much as possible early on in the planning process if complete consensus is not achievable.

3. Air Defense Considerations

a. Ground ROE. Ground ROE when operating in a foreign country can differ significantly if the HN is willing or insists on providing some type of ground security or force protection. When this is the case, a typical arrangement is for the HN to provide overall base or facility security, and for US forces to provide local or perimeter security for each of their units. In any case, language barriers can prove to be a hindrance. Establish standard operating procedures (SOPs) that closely coordinate security and force protection measures.

b. Air ROE. Usually, US forces will provide air defense protection for their defended assets using a separate DAL. This is the preferred method of providing air defense as it reduces conflicts that arise from differences in ROE among multinational partners. In cases where US forces and HN forces are providing mutual protection to a defended asset, it must be clear who is controlling engagements. Where differences in ROE for either ABT or TBM exists, it is important to establish detailed procedural control measures for friendly airspace users to reduce the possibility of fratricide. One technique is to prepare an SOP of mutually agreed-upon ROE for each weapon system in theater. TBM ROE should be less difficult as classification of this threat is much easier. In any case, the US forces must not be denied the right to self-defense.

c. Passive Defense/Early Warning (EW). Most nations have an EW system to alert military and civilian populations of impending attacks. It is important to determine what I&W are available and to use them as necessary to maximize force protection. Commanders should not rely solely on host nation systems, but should deploy with their own EW capability. One technique is to establish voice and data TBM early warning systems and publish them in the operations order. Establish voice early warning nets and radios at each C2 node.

d. Liaison. Depending on level of operations security, conducting early liaison with the host nation to establish an air defense C2 structure is critical to a successful multinational IADS. Establish an SOP to provide for liaisons at critical C2 nodes within the JOA. Liaison duties will include deconfliction of ROE and procedural control measures at critical levels in the chain of command.

e. Language Barriers. Depending on the country, language can impose significant hardships on commanders who must communicate their military plans. This is especially important when operating under OPCON or TACON of foreign military leadership. Work out SOPs for communicating prior to the execution phase of any operation to ensure continuity and clarity. Make every effort to deploy with adequate linguists who understand military terminology to ensure clear communications. In cases where the language barrier is less significant, exchanging liaison officers and positioning them at critical C2 nodes may be adequate.

Appendix B
TRACK ID/CLASSIFICATION CONSIDERATIONS

Coordinate the air defense ID policy with the JICO to prevent or mitigate ID-related interoperability issues. Address the following specific technical issues for each TDL capable IADS node:

a. Identify primary and secondary interface capabilities.

b. Identify the ID set processed by the system (Link 11/11B or Link 16).

(1) Link 11/11B-based systems:

(a) Specific ID, Primary Amplification (Pri Amp), and ID Amplification (ID Amp) data elements implemented.

(b) System translation of ID data elements received from Link 16.

(2) Link 16-based systems:

(a) Specific ID, Platform, Type, Activity, and Nationality/Alliance data elements implemented.

(b) System translation of ID data elements transmitted to Link 11/11B.

c. Identify the ID symbology displayed to the operator. (See Figure B-1.)

(1) Are friends and unknown assumed friends displayed with the same symbol? If so, can the operator access more detailed information to discern friend and unknown assumed friend tracks, and is this an acceptable risk to situational awareness?

(2) Are hostile and unknown assumed enemies (suspects) displayed with the same symbol? If so, can the operator access more detailed information to discern hostile and unknown assumed enemy (suspect), does a hostile symbol cause automatic system engagement actions, and is this an acceptable risk?

(3) Are neutrals displayed with a unique symbol?

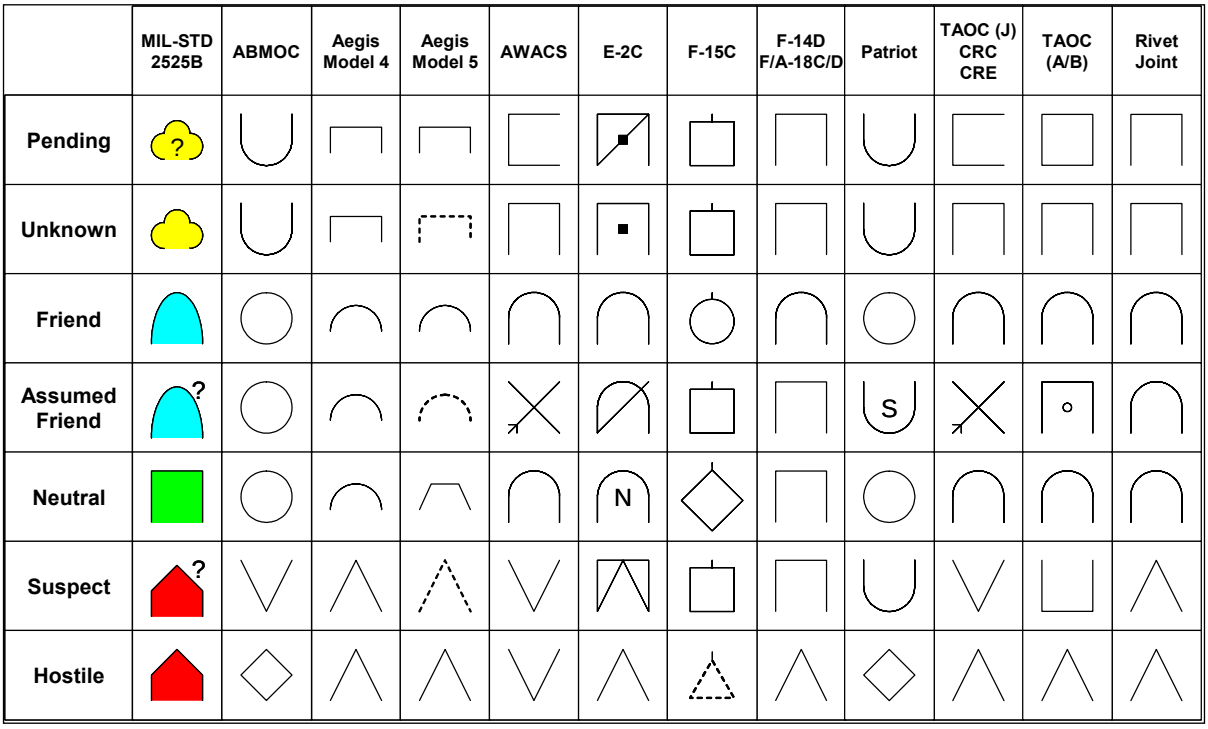

Figure B-1. Sample Track ID Table

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AREA AIR DEFENSE PLAN (U)

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GLOSSARY

PART I – ABBREVIATIONS AND ACRONYMS

A

A/A	air-to-air
A2C2	Army airspace command and control
AADC	area air defense commander
AADP	area air defense plan
AAMDC	Army Air and Missile Defense Command
AAW	antiair warfare
ABT	air-breathing threat; air-breathing target (USMC)
ACA	airspace control authority
ACE	aviation combat element (USMC); airborne command element (USAF)
ACO	airspace control order
ACP	airspace control plan
ACR	armored cavalry regiment
ACU	air control unit
ADA	air defense artillery
ADAFCO	air defense artillery fire coordination officer (Army)
ADAM	Air Defense Airspace Management
ADC	air defense commander (USN)
ADCCN	air defense command and control net
ADCP	air defense communications platform
ADS	Air Defense Sector
ADSI	air defense system integrator (USA)
ADU(S)	air defense unit (secondary)
ADW	air defense warning
AFDC	Air Force Doctrine Center
AFDD	Air Force Doctrine Document
AFFOR	Air Force forces
AFI	Air Force Instruction
AFPD	Air Force Policy Document
AFTTP	Air Force tactics, techniques, and procedures (inter-Service)
ALSA	Air Land Sea Application Center

AMDCOORD	air and missile defense coordinator (USA)
AMDPCS	air and missile defense planning and control system (USA)
AMDWS	air and missile defense workstation (USA)
ANDVT	advanced narrow band digital voice terminal
ANG	Air National Guard
AO	area of operations
AOC	air operations center
AOR	area of responsibility
ARFOR	Army forces
ARG	amphibious ready group
ARNG	Army National Guard
ASCIET	All Service Combat Identification Evaluation Team
ASIT	adaptable surface interface terminal
ASM	air-to-surface missile
ASW	antisubmarine warfare
ATC	air traffic control
ATDL1	Army tactical data link 1
ATO	air tasking order
AWACS	airborne warning and control system

B

BCD	battlefield coordination detachment
BDZ	base defense zone

C

C2	command and control
C2WC	command and control warfare commander (USN)
C4I	command, control, communications, computers, and intelligence
CAOC	combined air operations center
CAS	close air support; combined antenna system
CATF	commander, amphibious task force
CAV	cavalry (USA)
CCB	configuration control board
CCD	central communication display (USA)
CCS	control and communication subsystem

CDS	combat direction system
CEC	cooperative engagement capability
CG	guided missile cruiser
CGS	common ground station
CGS RWS	JSTARS Common Ground Station Remote Work Station
CID	combat identification
CIDC	combat identification coordinator
CIDS	combat identification systems
CIWS	Close-in Weapon System (USN)
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CLF	commander, landing force
CM	cruise missile
COC	combat operations center
COD	combat operations division
COMAFFOR	Commander, Air Force forces
CONOPS	concept of operations
CP	command post
CRC	control and reporting center
CTP	common tactical picture
CTT-3	commander's tactical terminal – 3
CV	aircraft carrier
CVBG	carrier battle group
CVN	aircraft carrier, nuclear
CVW	carrier air wing
CWAR	continuous wave acquisition radar
CWC	composite warfare commander

D

DAADC	deputy area air defense commander
DAL	defended asset list
DAS	direct air support
DCA	defensive counter air
DCN	data link coordination network
DD	navy destroyer
DDG	guided missile destroyer

DII	defense information infrastructure
DII COE	defense information infrastructure common operating environment
DISA	Defense Information Systems Agency
DISE	Deployable Intelligence Support Element
DISN	Defense Information Systems Network
DLRP	data link reference point
DNC	data network coordinator
DNMFL	Dual Net Multi Frequency Link
DNVT	digital non-secure voice terminal
DS	direct support; database specification
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
DSVT	digital secure voice telephone
DTE	detect-to-engage

E

EA	electronic attack
EAC	echelons above corps
EHF	extremely high frequency
EMCAP	electromagnetic compatibility analysis program
EMT	expert missile tracker
EO	engagement operations
EOB	enemy order of battle
EPLRS	Enhanced Position Location Reporting System
EW	electronic warfare; early warning
EWS	early warning station

F

FA	formation assessment
FAAD	forward area air defense
FAC (A)	forward air controller (airborne)
FCR	fire control radar
FDL	FAAD data link
FEZ	fighter engagement zone
FFG	guided missile frigate
FJUA	forwarding JTIDS unit, TADIL J – TADIL A

FJUAB	forwarding JTIDS unit, TADIL J – TADIL A/B
FJUB	forwarding JTIDS unit, TADIL J – TADIL B
FLIR	forward-looking infrared
FM	field manual
FO	force operations
FOB	forward operations base; friendly order of battle
FPU	forwarding participating unit
FRU	forwarding reporting unit
FSCOORD	fire support coordinator
FSE	fire support element

G

G/A	ground to air
G-2	Army or Marine Corps component intelligence staff officer (Army
G-3	Army or Marine Corps component operations staff officer (Army
GALE	Generic Area Limitation Environment (USA)
GBDL	ground-based data link
GBS	Global Broadcast Service
GCCS	Global Command and Control System
GCI	ground control intercept
GCSS	Global Combat Support System
GEM	guidance enhanced missile
GRU	grid reference unit
GS	general support
GS-R	general support reinforcing

H

HARM	high-speed anti-radiation missile
HDR	high data rate
HEU	higher echelon unit
HF	high frequency
HIMAD	high-to-medium altitude air defense
HMMWV	high mobility multipurpose wheeled vehicle
HN	host nation
HS	helicopter ASW squadron (USN)
HVA	high-value assets

I

I&W	indications and warning
IADS	integrated air defense system
IAW	in accordance with
IBS	Integrated Broadcast Service
ICBM	intercontinental ballistic missile
ICC	information coordination center
ICO	interface control officer
ID	identification
IFF	identification, friend or foe
IJMS	interim JTIDS message standard
INF	infantry (USA)
INS	inertial navigation system
IPAWS	Interim Pager Alert Warning System (USA)
IPB	intelligence preparation of the battlespace
IRST	infrared search and tracking
ISR	intelligence, surveillance, and reconnaissance
IST	interswitch trunk
IU	interface unit

J

J-3	Operations Directorate of a joint staff
J-6	Command, Control, Communications, and Computer Systems Directorate of a joint staff
JAOC	joint air operations center
JBC	joint command, control, communications, computers, intelligence, surveillance, and reconnaissance battle center
JDISS	Joint Deployable Intelligence Support System
JDN	joint data network
JEZ	joint engagement zone
JFACC	joint force air component commander
JFC	joint force commander
JIC	Joint Intelligence Center
JICO	joint interface control officer
JICU	joint interface control unit

JMTOP	joint multi-TDL operating procedures
JNL	JTIDS network library
JOA	joint operations area
JPN	joint planning network
JSIPS	Joint Services Imagery Processing System
JSTARS	Joint Surveillance Target Attack Radar System
JSWS	JSTARS Work Station
JTAGS	joint tactical ground station
JTDC	joint track data coordinator
JTF	joint task force
JTIDS	Joint Tactical Information Distribution System
JTMD	joint theater missile defense
JTOC	joint tactical operations center
JU	JTIDS unit
JVMFGW	Joint Variable Message Format Gateway
JWARN	joint warning
JWICS	Joint Worldwide Intelligence Communications System

K

KM	kilometers

L

LAAD	low-altitude air defense
LAN	local area network
LAV (AD)	light armored vehicle (air defense)
LCC	amphibious command ship
LDR	low data rate
LHA	general purpose amphibious assault ship
LHD	general purpose amphibious assault ship (with internal dock)
LNO	liaison officer
LOS	line of sight

M

MACCS	Marine Air Command and Control System
MACS	Marine Air Control Squadron
MAGTF	Marine air-ground task force

MAMD	Maneuver Air and Missile Defense
MANPADS	Man-Portable Air Defense System
MARFOR	Marine Corps forces
MATCD	Marine air traffic control detachment
MAWTS 1	Marine Aviation Weapons and Tactics Squadron One
MCAS	Marine Corps Air Station
MCCDC	Marine Corps Combat Development Command
MCE	modular control equipment
MCPDS	Marine Corps Publication Distribution System
MCRP	Marine Corps Reference Publication
MCS/P	Maneuver Control System/Phoenix (USA)
MCWP	Marine Corps Warfighting Publication
MDA	Missile Defense Agency
MDR	medium data rate
MDU	mission data update
MEF	Marine expeditionary force
METT-T	mission, enemy, terrain and weather, troops and support available, time available
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, and civilians
MEU	Marine expeditionary unit; mission essential units (USN)
MEZ	missile engagement zone
MILSTRIP	military standard requisitioning and issue procedure
MMT	master message terminal
MNF	Multinational Force
MRR	minimum risk route
MSCS	multi-source correlation system (USMC)
MSE	multiple subscriber equipment
MSI	multi-spectral imagery
MSTS	Multiple Source Tactical System (USA)
MTI	moving target indicator
MWCS	Marine wing communications squadron

N

NATO	North Atlantic Treaty Organization
NAVMACS	Naval modular automated communication system

NAVSOP	Navy standing operating procedures
NBC	nuclear, biological, and chemical
NCS	net control station
NCTR	non-cooperative target recognition
NGA	National Geospatial Intelligence Agency
NIPRNET	Unclassified but Sensitive Internet Protocol Router Network
NM	nautical mile
NSSMS	NATO Sea Sparrow Missile System
NSWC PHD	Naval Surface Warfare Center, Port Hueneme Division
NTDC	non-tactical data collection
NTDS	Naval tactical data system
NTR	network time reference
NWDC	Navy Warfare Development Command
NWP	naval warfare publication

O

OAAW	offensive antiair warfare
OAS	offensive air support
OB	order of battle
OCA	offensive counterair
OIC	officer in charge
OM	operations module
OPCON	operational control
OPLAN	operation plan
OPR	office of primary responsibility
OPTASK	operational task
OPTASKLINK	operational tasking data link
OTC	officer in tactical command
OTCIXS	officer in tactical command information exchange system
OTH	over the horizon

P

PAC-2	Patriot Advanced Capability-2
PAC-3	Patriot Advanced Capability-3
PADIL	Patriot digital information link
PFU	Patriot firing unit

PGM	precision-guided munition
PPLI	precise participant location and identification
PR	position references
PTL	primary target line
PU	participating unit

R

R	reinforcing
RADC	regional air defense commander
RAM	rolling airframe (USN)
RCU	remote control unit
RCV	receive
RICO	regional interface control officer
ROE	rules of engagement
RSR	remote sensor relay
RTF	return to force
RTU	remote terminal unit
RU	reporting unit

S

S3	battalion or brigade operations staff officer (Army; Marine Corps battalion or regiment)
SAAWC	sector anti-air warfare coordinator (USMC)
SAAWF	sector antiair warfare facility
SADC	sector air defense commander
SADF	Sector Air Defense Facility
SADO	sector air defense officer
SAM	surface-to-air missile
SAR	synthetic aperture radar
SATCOM	satellite communication
SCC	system coordinate center (USA); sea combat commander (USN)
SDZ	surface danger zone
SEAD	suppression of enemy air defenses
SES	ship-based electronic system
SG	strike group
SHF	super high frequency

SHORAD	short-range air defense
SICO	sector interface control officer
SINCGARS	Single-channel Ground and Airborne Radio System
SIPRNET	SECRET Internet Protocol Router Network
SM	surface missile
SME	subject matter expert
SOC	sector operations center
SOP	standard operating procedure
SPINS	special instructions
SROE	standing rules of engagement
SSS	system subsystem specification
STU-III	secure telephone unit III
STWC	strike warfare commander (USN)
SUWC	surface warfare commander (USN)

T

TAAMDCOORD	Theater Army air and missile defense coordinator
TAC (A)	tactical air coordinator (airborne)
TACC	tactical air command center (USMC); tactical air control center (USN)
TACDR	tactical detection and reporting (USA)
TACINTEL	tactical intelligence
TACON	tactical control
TACOPDAT	tactical operational data
TACS	tactical air control system; Theater Air Control System
TADC	tactical air direction center
TADIL	tactical digital information link
TADIXS	tactical data information exchange system
TAMD	theater air and missile defense
TAOC	tactical air operations center
TASM	tactical air to surface missile
TATC	tactical air traffic control
TBM	theater ballistic missile
TBMCS	Theater Battle Management Core System
TCS	target control system; television camera system
TDAR	tactical defense alert radar

TDDS	TRAP Data Dissemination System
TDS	tactical data systems
TDL	tactical data link
TF	task force (USN)
TG	task group (USN)
TIBS	tactical information broadcast service
TLAM	Tomahawk land-attack missile
TM	theater missile
TOC	tactical operations center
TRADOC	US Army Training and Doctrine Command
TRITAC	tri-service tactical communications
TSN	track supervision network
TTP	tactics, techniques, and procedures

U

UAV	unmanned aerial vehicle
UHF	ultra high frequency
USMC	United States Marine Corps
USMTF	United States message text format
USN	United States Navy
USWC	undersea warfare commander (USN)
UTC	unit type codes

V

VAQ	tactical EW squadron (USN)
VAW	carrier airborne early warning squadron (USN)
VF	fighter squadron (USN)
VFA	strike fighter squadron (USN)
VHF	very high frequency
VMF	variable message format

W

WCS	weapons control status

PART II – TERMS AND DEFINITIONS

air tasking order (ATO) – A method used to task and disseminate to components, subordinate units, and command and control agencies projected sorties, capabilities and/or forces to targets and specific missions. Normally provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions. (JP 1-02).

airspace control order (ACO) – An order implementing the airspace control plan that provides the details of the approved requests for airspace control measures. It is published either as part of the air tasking order or as a separate document. (JP 1-02)

area of operations (AO) – An operational area defined by the JFC for land and naval forces. Areas of operation do not typically encompass the entire operational area of the JFC, but should be large enough for component commanders to accomplish their missions and protect their forces.

area of responsibility (AOR) – The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. In naval usage, a predefined area of enemy terrain for which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation.

battlefield coordination detachment (BCD) – An Army liaison provided by the Army component or force commander to the air operations center and/or to the component designated by the joint force commander to plan, coordinate, and deconflict air operations. The BCD processes Army requests for air support, monitors and interprets the land battle situation for the air operations center, and provides the necessary interface for exchange of current intelligence and operational data. (JP 1-02)

control and reporting center (CRC) – A mobile command, control, and communications radar element of the US Air Force theater air control system subordinate to the air operations center. The CRC possesses four Modular Control Equipment operations modules and integrates a comprehensive air picture via multiple data links from air, sea, and land-based sensors as well as from its surveillance and control radars. It performs decentralized command and control of joint operations by conducting threat warning, battle management, theater missile defense, weapons control, combat identification, and strategic communications.

fighter engagement zone (FEZ) – In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with fighter aircraft.

high-payoff target (HPT) – A target whose loss to the enemy will significantly contribute to the success of the friendly course of action. High-payoff targets are those high-value targets that must be acquired and successfully attacked for the success of the friendly commander's mission. (JP 1-02)

high-value target (HVT) – A target the enemy commander requires for the successful completion of the mission. The loss of high-value targets would be expected to seriously degrade important enemy functions throughout the friendly commander's area of interest. (JP 1-02)

intelligence estimate – The appraisal (written or oral) of available intelligence relating to a specific situation or condition with a view to determining the courses of action open to the enemy or potential enemy and the order of probability of their adoption.

intelligence preparation of the battlespace (IPB) – An analytical methodology employed to reduce uncertainties concerning the enemy, environment, and terrain for all types of operations. Intelligence preparation of the battlespace builds an extensive database for each potential area in which a unit may be required to operate. The database is then analyzed in detail to determine the impact of the enemy, environment, and terrain on operations and presents it in graphic form. Intelligence preparation of the battlespace is a continuing process. (JP 1-02)

intelligence process – The process by which information is converted into intelligence and made available to users. There are six phases in the process: planning and direction; collection; processing and exploitation; analysis and production; dissemination and integration; and evaluation and feedback.

intelligence – The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign nations, hostile or potentially hostile elements, or areas of actual or potential operations. The term is also applied to the activity that results in the product and to the organization engaged in such activity.

joint engagement zone (JEZ) – In air defense, that airspace of defined dimensions, within which multiple air defense systems (surface-to-air missiles and aircraft) are simultaneously employed to engage air threats. (JP 1-02)

missile engagement zone (MEZ) – In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with surface-to-air missiles. (JP 1-02)

M-Series Messages – The messages used to exchange information over Link 11.

near real time (NRT) – Pertaining to the timeliness of data or information that has been delayed by the time required for electronic communication and automatic data processing. This implies that there are no significant delays.

tactical operational data (TACOPDAT) – The TACOPDAT is used to permit the joint operational commander to establish air defense and antiair warfare responsibilities in a tactical area and to permit an area commander to provide supplementary orders for his area of responsibility.

track – To display or record the successive positions of a moving object.

FM 3-01.15
MCRP 3-25E
NTTP 3-01.8
AFTTP(I) 3-2.31

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